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* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the display and the method of presentation which control the luminescence brightness of the light-emitting part material arranged at the plane based on the input data which quantized the brightness of a pixel, and indicate by the pixel, and the medium which recorded the display-control program.
[0002]
[Description of the Prior Art] Conventionally, what is shown in JP,59-208587,A is known as this kind of a display. A pixel indication of the display indicated by this official report is given by carrying out burning control of the brightness of each light emitting device according to the brightness of a pixel, arranging to a plane the light emitting device in which intensity control is possible. Under the present circumstances, intensity control of the original video signal is quantized and carried out to 64 steps, and that minimum brightness condition is in the condition of not switching on the light.
[0003]
[Problem(s) to be Solved by the Invention] In the conventional display mentioned above, while using from the condition of not switching on the light to the burning condition of the maximum brightness and considering as the rich image of contrast, the condition that the condition of not switching on the light, and a burning condition repeat through a very small period in response to the effect of a noise etc. arises, and it is sensed that it flickers in a dark part for those who look at an image in the neighborhood in the original condition do not switch on the light. Moreover, the condition of not switching on the light is stabilized [between / the element colors of RGB] about a certain color, and when flickering about other colors arises, about the flickering part, the color of the element color which will be in a burning condition may be attached. That is, supposing a red element color flickers and other element colors do not flicker, a flicker will act so that red may be given to the part, and will give unnatural sensibility.
[0004] This invention was made in view of the above-mentioned technical problem, loses a flicker, and aims at offer of the display which can prevent unnatural coloring, the method of presentation, and the medium which recorded the display-control program.
[0005]
[Means for Solving the Problem] In order to attain the above-mentioned object, invention concerning claim 1 Are the indicating equipment which controls the luminescence brightness of the light-emitting part material arranged at the plane based on the input data which quantized the brightness of a pixel, and indicates by the pixel, and as the luminescence brightness a based on quantization data, and reflective brightness b by the extraneous light When the ratio of the original condition of not switching on the light, and a burning condition is expressed with b:a+b, it has considered as the configuration which controls the condition of not switching on the light so that this ratio does not serve as infinity.
[0006] In invention concerning claim 1 constituted as mentioned above, although the luminescence brightness of the light-emitting part material arranged at the plane based on the input data which quantized the brightness of a pixel is controlled and it indicates by the pixel, when it is the luminescence brightness a based on quantization data, and the reflective brightness b by the extraneous light, the ratio of the condition of not switching on the light and the burning condition in each light-emitting part material is expressed with b:a+b. If night also comes at this time, since the

reflective brightness b will approach "0" infinite, this ratio serves as infinity. Of course, if it says strictly, although reflective brightness "b" at night is not set to 0, this ratio can say it as infinity substantially. Therefore, when the condition of not switching on the light, and a burning condition will be repeated by the noise etc., a flicker will be in sight clearly by the brightness ratio of infinity. However, in invention concerning claim 1, the condition of not switching on the light is controlled so that this ratio does not serve as infinity. If it is made for the condition of not switching on the light, and a brightness ratio when that is not right not to serve as infinity, it will not become a big change visually but a flicker will be pressed down.

[0007] The light-emitting part material arranged at the plane means the so-called thing arranged in the shape of a matrix two-dimensional, and does not need to be a flat side. Moreover, it must necessarily be in a rectangular lattice point location also about two-dimensional arrangement. The concrete technique for the condition of not switching on the light, and a brightness ratio when that is not right not to serve as infinity can apply various kinds of technique to quantization data to the condition of not switching on the light, and a burning condition being distinguished clearly. As the example, as luminescence brightness c at the time of original un-switching on the light, invention concerning claim 2 is considered as the configuration in which it is made for b+c:a+b which is the ratio of the condition of not switching on the light, and a burning condition not to serve as infinity in the display according to claim 1, when the reflective brightness b of an extraneous light falls.

[0008] In invention concerning claim 2 constituted as mentioned above, if based on quantization data, even if it is a time of being un-switching on the light, even when the reflective brightness b of an extraneous light falls by becoming the luminescence brightness c as a certain luminescence condition, originally b+c:a+b which is the ratio of the condition of not switching on the light, and a burning condition will not serve as infinity. That is, by quantization data, even if it is in the condition of not switching on the light, it has prevented becoming infinite by considering as a luminescence condition.

[0009] Moreover, invention which starts claim 3 as other examples by the same view is an indicating equipment which controls the luminescence brightness of the light-emitting part material arranged at the plane based on the input data which quantized the brightness of a pixel, and indicates by the pixel, and is considered as the configuration displayed by the minimum brightness also about the input data showing the condition of not switching on the light. Also in invention concerning claim 3 constituted as mentioned above, although the luminescence brightness of the light-emitting part material arranged at the plane based on the input data which quantized the brightness of a pixel is controlled and it indicates by the pixel, it expresses as the minimum brightness also about the input data showing the condition of not switching on the light. The perfect condition of not switching on the light is lost by this, and the ratio between the minimum brightness of the minimum brightness when being in the condition of not switching on the light, in input data, and a burning condition stops serving as infinity.

[0010] As mentioned above, concrete technique for the ratio of the brightness when being in the condition of not switching on the light, in input data, and the minimum brightness in a burning condition not to serve as infinity, and carry out can adopt various kinds of things. As the example, invention concerning claim 4 is considered as the configuration to which only the specified quantity makes the brightness in the above-mentioned light-emitting part material increase uniformly in the display according to claim 1 to 3. In invention concerning claim 4 constituted as mentioned above, when only the specified quantity makes the brightness in light-emitting part material increase uniformly, input data will be in a burning condition with the brightness increased even if the condition of not switching on the light is shown. It seems that it may be made to increase uniformly in the phase of data, and the increment in this brightness may be increased as an amount of offset in light-emitting part material. In this case, you may be the functional increment to which augend becomes small gradually.

[0011] Furthermore, in the indicating equipment according to claim 1 to 4, invention concerning claim 5 is considered as the configuration which does not equip this translation table with the data showing the condition of not switching on the light while it has the translation table which changes the above-mentioned input data. In invention concerning claim 5 constituted as mentioned above, although input data will be changed with this translation table when it is what has the translation table which changes input data in treating quantization data, the condition of after conversion of not switching on the light is surely lost by not having data with which this translation table expresses the condition of not switching on the light.

[0012] It is not necessary to necessarily restrict the data showing the condition in this case of not switching on the light to the thing showing "0", and they should just express the brightness in the condition of not switching on the light, as a

thing showing the brightness of light-emitting part material. Furthermore, while invention concerning claim 6 has the conversion filter which changes the above-mentioned input data in an indicating equipment according to claim 1 to 5, this filter is considered as the configuration changed into the burning data of the predetermined minimum brightness, when the data showing the condition of not switching on the light are inputted.

[0013] In invention concerning claim 6 constituted as mentioned above, if it has the conversion filter which changes the above-mentioned input data and the data showing the condition of not switching on the light are inputted into this filter, the light will be switched on by the minimum brightness, without being changed into the burning data of the predetermined minimum brightness, consequently light-emitting part material being in the condition of not switching on the light. Furthermore, invention concerning claim 7 is considered as the configuration whose origin of quantization data is "1" in the indicating equipment according to claim 1 to 6.

[0014] In invention which starts claim 7 constituted as mentioned above although quantization data start from "0" conventionally and the condition of not switching on the light has arisen, from the first, although the origin of quantization data is "1" therefore, it will have the condition of not switching on the light. Furthermore, in the display according to claim 1 to 7, in addition to the above-mentioned light-emitting part material, invention concerning claim 8 has supplemental lighting, and is considered as the configuration which is made to turn on this supplemental lighting and gives the minimum brightness also in the condition of a pixel of not switching on the light.

[0015] In invention concerning claim 8 constituted as mentioned above By having supplemental lighting in addition to the above-mentioned light-emitting part material, and making this supplemental lighting turn on, even if it will be in the condition of not switching on the light, based on the input data with which the light-emitting part material itself was quantized Making supplemental lighting turn on, also in the condition of a pixel of not switching on the light, the screen of a display will have the brightness more than fixed for making it a ratio with a burning condition not become infinity. Furthermore, in the display according to claim 1 to 8, invention concerning claim 9 produces the condition of the above-mentioned light-emitting part material of not switching on the light, when the reflective brightness of an extraneous light is beyond a predetermined value, and when it is below a predetermined value, it is considered as the configuration it is made not to produce the condition of the above-mentioned light-emitting part material of not switching on the light.

[0016] It can be said to be that the reflective brightness of an extraneous light does not fully become a problem in a certain case whether the brightness ratio of the condition of not switching on the light, and a burning condition serves as infinity. For this reason, it sets to invention concerning claim 9 constituted as mentioned above. Based on whether the reflective brightness of an extraneous light is beyond a predetermined value, when reflective brightness is beyond a predetermined value, even if it produces the condition of light-emitting part material of not switching on the light, are satisfactory. It is made not to produce the condition of light-emitting part material of not switching on the light so that this reflective brightness may become below a predetermined value and the brightness ratio of the condition of not switching on the light, and a burning condition may not serve as infinity in substantial semantics on the other hand.

[0017] The processing which does not produce the condition mentioned above based on the input data which quantized the brightness of a pixel of not switching on the light Invention which is effective and starts claim 10 as the example also to the processing at the time of quantizing the video signal showing brightness It has considered as the configuration it is made not to make the above-mentioned light-emitting part material based on tales-doses child-ized data produce the condition of not switching on the light, changing this video signal into quantization data, in order to change into the range in light-emitting part material in which a brilliance control is possible to the fluctuation range of the video signal showing brightness.

[0018] In invention concerning claim 10 constituted as mentioned above, although the brightness range is effectively quantized also in order to acquire the greatest contrast in original quantization, also in this case, the condition of the ratio of the brightness of the infinity produced between the condition of not switching on the light, and a burning condition, by making it not make it generated of the condition of not switching on the light is lost, and a flicker is pressed down. Moreover, the technique of not producing the condition mentioned above based on the quantized input data of not switching on the light does not need to be limited to equipment with a stereo, and functioning also as the approach can understand it easily. For this reason, invention concerning claim 11 is the method of presentation which controls the luminescence brightness of the light-emitting part material arranged at the plane based on the input data which quantized the brightness of a pixel, and indicates by the pixel. When the ratio of the original condition of not switching on the light, and a burning condition is expressed with b:a+b as the luminescence brightness a based on

quantization data, and reflective brightness b by the extraneous light, it constitutes as an approach of controlling the condition of not switching on the light so that this ratio does not serve as infinity.
[0019] That is, there is no difference not only in the equipment which not necessarily has a stereo but in being effective as the approach. By the way, as mentioned above, as thought of that it may be used in the condition of existing independently and having been included in a certain device, and invention, that it is software or hardware etc. can change such a display suitably including various kinds of modes. When becoming the software which controls a display as an example of embodiment of the thought of invention, naturally it exists on the record medium which recorded this software, and it must be said that it is used.
[0020] As the example, invention concerning claim 12 It is the medium which recorded the display-control program which controls the luminescence brightness of the light-emitting part material arranged at the plane based on the input data which quantized the brightness of a pixel, and indicates by the pixel. When the ratio of the original condition of not switching on the light, and a burning condition is expressed with b:a+b as the luminescence brightness a based on quantization data, and reflective brightness b by the extraneous light, it has considered as the configuration which controls the condition of not switching on the light so that this ratio does not serve as infinity.
[0021] of course, the record medium may be a magnetic-recording medium, may be a magneto-optic-recording medium, and can completely be considered the same way in any record media developed from now on. Moreover, about duplicate phases, such as a primary replica and a secondary replica, it is equivalent without room to completely ask. In addition, it is the same even if it seems that it changed to this invention being used, thru/or was written in the semiconductor chip even when carrying out as the supply approach using a communication line.
[0022] Furthermore, a part is software, when the part is realized by hardware, there is nothing that is completely different in the thought of invention, and it may be made into the thing of a gestalt which records the part on the record medium and is read suitably if needed.
[0023]
[Effect of the Invention] The display which can prevent this invention being colored a specific element color while a flicker is prevented, since it was made for the ratio of the condition of not switching on the light, and a burning condition not to serve as infinity, and becoming an unnatural image as explained above can be offered.
[0024] Moreover, according to invention concerning claim 2, the luminescence brightness c is given also at the time of original un-switching on the light, and it can realize at it. Furthermore, according to invention concerning claim 3, it can display and realize by the minimum brightness also about the input data showing the condition of not switching on the light. Furthermore, according to invention concerning claim 4, only the specified quantity is realizable with the very easy technique of making brightness increase uniformly. Furthermore, according to invention concerning claim 5, it can realize very simply only by making it there be no data which express the condition of not switching on the light, in the translation table of input data.
[0025] Furthermore, according to invention concerning claim 6, when the data showing the condition of not switching on the light are inputted, only the filter changed into the burning data of the predetermined minimum brightness can realize. Furthermore, according to invention concerning claim 7, since the origin of quantization data is only set to "1", it can realize very simply also to the existing thing. Furthermore, since according to invention concerning claim 8 supplemental lighting is made to turn on and the minimum brightness is given to a display also in the condition of a pixel of not switching on the light, there is no need of adding a hand to the luminescence brightness of the existing light-emitting part material, and implementation becomes easy.
[0026] Furthermore, since it is made not to produce the condition of light-emitting part material of not switching on the light according to invention concerning claim 9 only when the reflective brightness of an extraneous light is below a predetermined value, width of face of contrast in case the reflective brightness of an extraneous light is beyond a predetermined value can be enlarged as much as possible. Furthermore, according to invention concerning claim 10, a flicker etc. can be prevented when being later displayed as an image by applying when quantizing a video signal.
[0027] Furthermore, according to invention concerning claim 11, the method of presentation which it is colored a specific element color and can be made not to become an unnatural image can be offered, a flicker preventing. Furthermore, according to invention concerning claim 12, the medium which recorded the display-control program which it is colored a specific element color and can be made not to become an unnatural image can be offered, a flicker preventing.
[0028]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing 1 shows the large-sized LED display equipment of the outdoor type which applied the indicating equipment concerning 1 operation gestalt of this invention with the outline block diagram, and drawing 2 shows the video signal of a composite inputted into the LED display equipment concerned by the wave form chart.
[0029] In this drawing, the video-signal processing circuit 10 outputs a synchronizing signal to the timing signal generating circuit 20 while it inputs the video signal of a composite and outputs the primary color drive signal of RGB. The timing signal generating circuit 20 generates the timing signal to each circuit later mentioned based on the input timing of a synchronizing signal, and has generated the timing signal for sampling and carrying out A/D conversion to the A/D-conversion circuit 30 where each primary color drive signal of RGB is inputted.
[0030] It has the A/D-conversion circuit 30 for every primary color drive signal of RGB, it samples the primary color drive signal serially inputted as an analog signal based on the above-mentioned timing signal, and changes it into a 8-bit digital signal. Although the offset level of an original video signal as shown in drawing 2 also in a primary color drive signal is given, when 8 bits considers as 256 gradation in this way, in order to raise resolution, this offset level is deducted. Therefore, in order to make contrast of a former image effective in the maximum, brightness will show [brightness] the maximum brightness condition of "255" level from the condition of "0" level of not switching on the light.
[0031] The conversion result by the A/D-conversion circuit 30 is recorded on the screen memory 50 by which the conversion result is prepared in each of RGB for every frame, after being inputted into the reverse gamma amendment filter 40 for returning the signal which was sent from the transmitting side and of which gamma amendment was done and making predetermined conversion according to the timing signal from the timing signal generating circuit 20. The reverse gamma amendment filter 40 consists of ROMs, and outputs the data memorized to this address to the 8-bit address input. Although this data supports the so-called signal of which gamma amendment was done, in this invention, it is different from the existing reverse gamma amendment so that it may mention later. In addition, the timing signal is inputted into the screen memory 50 from the timing signal generating circuit 20 mentioned above, a predetermined memory address is specified with an internal counter, and data are memorized by this memory address.
[0032] And based on the data memorized by this screen memory 50, the actuation circuit 60 drives LED71 of a display panel 70. This LED71 is formed as one unit for every pixel, and is prepared [Midori / blue and] one [at a time] two about red. Although red luminescence brightness is because it is low compared with other two colors, this can be suitably changed about the configuration of each pixel, and may constitute a display panel 71 from one chip by LED which can be displayed full color. Although the actuation circuit 60 adjusts the brightness of each LED71, in the case of this operation gestalt, it is adjusting by the time amount ratio of a burning condition and a putting-out-lights condition. That is, an intensity level is always turned on in the state of the max of "255", and is always un-switching on the light in the state of the min of an intensity level "0." In addition, since the blinking condition for adjusting brightness has the very high repeat frequency, a flicker does not pose a problem at all. In addition, it is determined by the timing signal from the timing signal generating circuit 20 which also mentioned above the decision of the timing of the burning condition in this case, and a putting-out-lights condition.
[0033] Although brightness is adjusted by the time amount ratio of a burning condition and a putting-out-lights condition in this operation gestalt, it is good also as a configuration using the light-emitting part material which carries out analogue conversion of the digital data showing brightness, and adjusts brightness with an analog voltage value. Here, the reverse gamma amendment filter 40 mentioned above is explained. The video-signal electrical-potential-difference (V1) pair display brightness (S) property in the Braun tube the gamma amendment itself S=V1 **2.2 -- (1) It is the amendment which comes out and is performed by signal output sides, such as a television broadcasting station side, according to being. V1 = V0 ** (-2.2) -- (2)
Amendment is performed based on the becoming relational expression. If it is made to display with the Braun tube based on the video-signal electrical potential difference to which this gamma amendment was performed, the relation of the original video-signal electrical-potential-difference (V0) pair display brightness (S) will become linear. Therefore, when it has displays other than the Braun tube (a light emitting diode, a plasma display panel, liquid crystal, etc.), it is. S=V0 ** (-2.2) -- (3)
Since it becomes, reverse gamma amendment is needed. For example, if a video-signal electrical-potential-difference pair brightness property is linear, it is the output video-signal electrical potential difference VOUT. Relation of the input video-signal electrical potential difference VIN VOUT =VIN**2.2 -- (4)

Then, it is good.
[0034] Drawing 3 shows the content of the translation table at the time of presupposing that the reverse gamma amendment temporarily shown in (4) types is applied. An axis of abscissa X is used as input data, an axis of ordinate Y is used as the output data after amendment, and it is conversion in the case of 256 gradation. Y=255(X/255) **2 -- (5) It matches with the becoming simple relational expression. However, in such response relation, when output-data Y is "0", LED71 will be in the condition of not switching on the light, and when output-data Y is "1", LED71 will be in a burning condition. When it quantizes by having excepted below the offset level of the video signal shown in drawing 2 and is made into "0" near the offset level of a video signal, output-data Y will be set to "0" by the noise in a video signal etc., or it will be set to "1." If luminescence brightness [of LED71 in case output-data Y is "1"] a [a candela/square meter], and reflective brightness b [a candela/square meter] by the extraneous light, when output-data Y is "0", it is set to b [a candela/square meter], and when output-data Y is "1", it will become [(a+b) a candela/square meter]. A problem does not have the reflective brightness b by the extraneous light to some extent like day ranges for those who in a certain case see even if output-data Y is set to "0" or is set to "1", since this ratio is small. However, when night comes and the extraneous light has fallen, even if it compares with the minimum brightness of LED71, it becomes the forge fire which can fully be disregarded. In this case, the contrast ratio when output-data Y being set to "0", or being set to "1" becomes very large. Since the frequency which repeats blinking in order to adjust brightness, as mentioned above is very high, a flicker becomes satisfactory, but since fluctuation of output-data Y is performed per frame, its frequency is low and can fully sense it by human being's eyes. Then, the more the surroundings become dark, the more a flicker comes to clarify.
[0035] On the other hand, even if it changes output-data Y between "1" and "2", this does not pose a problem at all. When output-data Y is "2", supposing it becomes [(2 a+b) a candela/square meter], even if the reasons which do not pose a problem are [(a+b) a candela/square meter] when output-data Y is "1", and the reflective brightness b of an extraneous light is "0", a brightness ratio serves as two times. As [show / this operation gestalt / in drawing 4 / since it is such, do not adopt the transformation of (5) types, but] Y= (255-1) and (X/255) **2+1 -- (6)
The becoming transformation is adopted and it is recording on the reverse gamma amendment filter 40. (6) When the brightness range in LED71 which can be adjusted is the "255" level from "0" level, even if a formula is the minimum value, it means that the brightness of "1" level is given and the brightness of LED71 changes, the fluctuation ratio will be settled in the comparatively small range of about several times.
[0036] Next, actuation of this operation gestalt which consists of the above-mentioned configuration is explained. If the video signal of the composite outputted through intermediate frequency processing etc. from a television tuner etc. is inputted into the video-signal processing circuit 10, this video-signal processing circuit 10 will be changed and outputted to the primary color drive signal of RGB based on the video signal inputted serially while it outputs a synchronizing signal to the timing signal generating circuit 20. A/D conversion of the primary color drive signal of each color is carried out in the A/D-conversion circuit 30 to the sampling timing according to the arrangement situation of LED71 in a display panel 70. At this event, it is changed as linear digital value to the pure reinforcement in a video signal.
[0037] The conversion result of the A/D-conversion circuit 30 serves as an address input of the reverse gamma amendment filter 40 which consists of ROMs, serves as data with which the translation data memorized to this address expresses the brightness of each pixel, and is memorized to the predetermined address of the screen memory 50. It is either of the "1" level - "255" level, and the so-called condition of "0" level of not switching on the light is not generated as the brightness value changed here is shown in drawing 4 . Of course, although the condition of not switching on the light has arisen in strict semantics since the brilliance control of LED71 itself is carrying out by the time amount ratio of a burning condition and a putting-out-lights condition, the condition in the semantics whether it is detectable with human being's vision of not switching on the light does not arise.
[0038] Consequently, as for the luminescence brightness of LED71, "1" level is secured even if it is a case so that brightness may be set to "0", when an offset level is taken into consideration as that into which a video signal as shown in drawing 2 is inputted. On the other hand, when a noise takes a video signal, fluctuation arises also to the primary color drive signal inputted into the A/D-conversion circuit 30. The output data of this reverse gamma amendment filter 40 are only changed with the value more than "1", and seem therefore, for a fluctuation ratio not to become infinite although the input data of the reverse gamma amendment filter 40 is changed in a dark part. Even if this fluctuation is night, it does not give great not fluctuation but sensation which flickers for those who are looking at the display panel

70.
[0039] On the other hand, the secondary effect of this gives the further effectiveness of losing unnatural coloring. When a primary color drive signal is conventionally generated based on a video signal, the variation between each color of RGB will arise. If it is the range which can permit the variation between each color, the variation itself cannot be sensed being the same as that of the case of the brightness ratio mentioned above, either, but red emits light, and if the brightness ratio between each color serves as infinity, green and blue will sense coloring certain, as light is not emitted. For example, suppose that human being's head was reflected in the image. In this case, since the pixel of the hair part of hair expresses black, brightness becomes low, and red presupposes that "1" and green are ["1" and blue] original brightness "1." At this time, even if it will be in the condition "1" That only red was set to "2" and increased in number rather than the brightness of green or blue by gap of balance, the difference of balance is hard to sense. However, in that only red is in the condition of "1" Having increased from the brightness of green or blue, if "1" and green are set to "0" and blue is set to "0", although red is the same, as for the part of the hair of hair, he will look red under the effect of the brightness ratio of infinity.
[0040] On the other hand, since the output data of the reverse gamma amendment filter 40 are "1" at least, the unnaturalness to which a specific color is attached to a dark color part is avoided. When the data with which reverse gamma amendment which set the origin of brightness to "1" for every pixel of RGB each color was performed are written in, the actuation circuit 60 makes the rate of the burning period of LED71 and putting-out-lights period in a display panel 70 change according to these data. Thereby, the luminescence brightness of LED71 becomes a thing proportional to the brightness of the original photographic subject.
[0041] By the way, about conversion of (6) types, and the LED display equipment shown in drawing 1 , it is only 1 operation gestalt of this invention. In case a video signal etc. is quantized, also in order to secure the width of face of contrast, the view of this invention does not prepare a fluctuation region where a brightness ratio becomes infinity from a putting-out-lights condition to it being the conventional view which is considered as the range to the maximum brightness condition. As the example, it is made to set an origin in the case of (6) types to "1" as a gradation value of quantization. In this case, although carried out to covering a reverse gamma amendment filter and coincidence, it is not necessary to necessarily carry out simultaneously. Drawing 5 shows the example equipped with the origin amendment filter 42 with the reverse gamma amendment filter 41 based on (5) types. A correction formula changes depending on the property of light-emitting part material. Therefore, it is also effective to carry out the filter which sets an origin to "1" about the reverse gamma amendment and quantization data with which the brightness property of light-emitting part material is compensated in the sense of a wide sense according to an individual.
[0042] Moreover, after writing in the usual quantization data to the screen memory 51, it is also effective to perform conversion shown in (6) types. Drawing 6 shows the outline configuration of the LED display equipment in such a case, and after it changes into the reverse gamma amendment filter 43, covering the reading data from the screen memory 51, it has inputted it into the actuation circuit 60. On the other hand, if a certain amendment is not necessarily applied to quantization data, it may be unable to realize. Drawing 7 shows the example realized without processing it in any way to the quantization data itself. The data quantized after the screen memory 51 had deducted the offset level from the primary color drive signal etc. like what is shown in drawing 6 are written in. This data carrying out 1 bit shift of the data, it turns ON the least significant 1 bit, and is made to increase it to "two times +1" by this input edge 61a here, although while is inputted into input edge 61a in the comparator 61. On the other hand, the output data of the reverse gamma amendment table 62 which consists of ROMs are inputted into input edge 61b of another side in this comparator 61, and the count output of the 8-bit counter 63 is inputted as an address input of this reverse gamma amendment table 62. Since Clock CLK is inputted into a counter 63 and reset input is applied every 256 clock CLK, the counter output has been repeatedly counted in "0-255", as shown in drawing 8 . Drawing 9 showed the content of storage of the above-mentioned reverse gamma amendment table 62, and the content was the same as that of the case of (5) types, and had merely carried out two times as data.
[0043] That is, the output data of the screen memory 51 serve as "two times +1", and are compared with the data which carried out the "two times" of what did reverse gamma amendment of the count output of Clock CLK. Consequently, even if it is data of "0" level as brightness, it will be in the condition that the "1" was added, and a burning period is amended further at the period to which reverse gamma amendment was applied. [minimum] It can consider as relation as substantially shown in drawing 4 , without processing quantization data by having such a comparator 61, the reverse gamma amendment table 62, and a counter 63 in an actuation circuit.

[0044] Moreover, it is also possible to enable setting out of the amount of offset in the actuation circuit 64, as for the purpose of not preparing a fluctuation region where a brightness ratio becomes infinity shows to drawing 10 , and to consider as the configuration to which the brightness according to the amount of the said offset is made to increase uniformly. In this case, what is necessary is just to establish the period turned on regardless of data, if it is LED71, and you may make it impress the electrical potential difference according to the amount of offset to the luminescence bulb 72 which has a filament as shown in this drawing 10 . As this example also shows, as light-emitting part material, it is not restricted to LED71, and a controllable member can be used for luminescence brightness in the range of predetermined brightness from the conditions of not switching on the light, such as the luminescence bulb 72.
[0045] although he is trying for a brightness ratio not to serve as infinity until now about the light-emitting part material itself turned on based on quantization data, the pixel flickers for the side to see -- it is able for a ****** to pose a problem and to think as a pixel. For this reason, although intensity control special to LED73a of RGB each color is not performed, apart from these, he prepares white LED73b, and is trying to give the minimum brightness by making this LED73b always turn on in the LED unit 73 shown in drawing 11 - drawing 13 .
[0046] In order to hold the protection-from-light nature between positioning and each color, this LED unit 73 inserted each LED73b from the transverse-plane side, and is equipped with fixable substrate 73c. Although the conventional substrate only equips with LED of RGB from a transverse-plane side, white LED73b is inserted in a part for a tooth-back center section about this substrate 73c, the fixable maintenance hole 73c1 is formed, and this maintenance hole 73c1 has formed the breakthrough 73c2 towards the transverse-plane side. This breakthrough 73c2 is formed more smallish, in order to adjust the luminescence brightness of LED73b, and it will emit light by the brightness at the time of giving "1" as brightness data to each LED73a of RGB.
[0047] In this configuration, white LED73b is always turned on. Since the minimum brightness of the amount of offset will be given to the brightness range of the conventional condition changing from a putting-out-lights condition in the range of the maximum brightness, it stops therefore, producing the field where a brightness ratio becomes infinite in the fluctuation range. Moreover, to the control system by quantization data, a hand is not added at all, either, and modification is easy. Of course, it is not necessary to restrict to LED73b as always turned-on light-emitting part material, it has another source of lighting, and may be made to carry out a light guide. Furthermore, the source of lighting which illuminates the screen by low brightness may be prepared out of a display.
[0048] Moreover, although he is trying not to always produce the condition of not switching on the light, in LED71 etc. until now, if it is in the condition which the reflective brightness b of an extraneous light cannot say as "0", contrast will also become rich, so that the brightness range is large. Drawing 14 is equipped with reverse gamma amendment filter 44a which memorizes both table conversion tables shown in the table conversion table shown in drawing 3 instead of and drawing 4 , and is making either choose it as said reverse gamma amendment filter 44a with the output of comparator 44b. [the reverse gamma amendment filter 40 shown in drawing 1] Input voltage is changed by photo transistor 44c which detects external luminous intensity about one input edge of comparator 44b, and an electrical potential difference can be adjusted by 44d of variable resistance about the input edge of another side. This photo transistor 44c is exposed outside, in order to detect external luminous intensity.
[0049] By considering as this configuration, if external luminous intensity is weak, the current which flows photo transistor 44c will become small, and the input voltage to comparator 44b will become low. Then, as compared with the electrical-potential-difference value set as the input edge of another side by 44d of variable resistance, it becomes small, and the output signal showing this comparison result makes the table conversion table shown in drawing 4 to reverse gamma amendment filter 44a choose. On the other hand, if external luminous intensity is strong, the current which flows photo transistor 44c will become large, and the input voltage to comparator 44b will become high. Then, since it becomes higher than the electrical-potential-difference value set as the input edge of another side by 44d of variable resistance, a comparison result is reversed and the table conversion table shown in drawing 3 to reverse gamma amendment filter 44a is made chosen.
[0050] Thus, when controlling the reinforcement of light-emitting part material, such as LED71, based on the data which quantized the video signal etc. and displaying an image Since it was made not to produce a field where processing to which the origin of quantization is changed to "1" from "0" is performed, and a brightness ratio becomes infinite in the fluctuation range of brightness with the reverse gamma amendment filter 40 which performs reverse gamma amendment etc., While a feeling of a flicker is lost, the unnatural coloring generated by gap of the balance between each element color can be avoided.

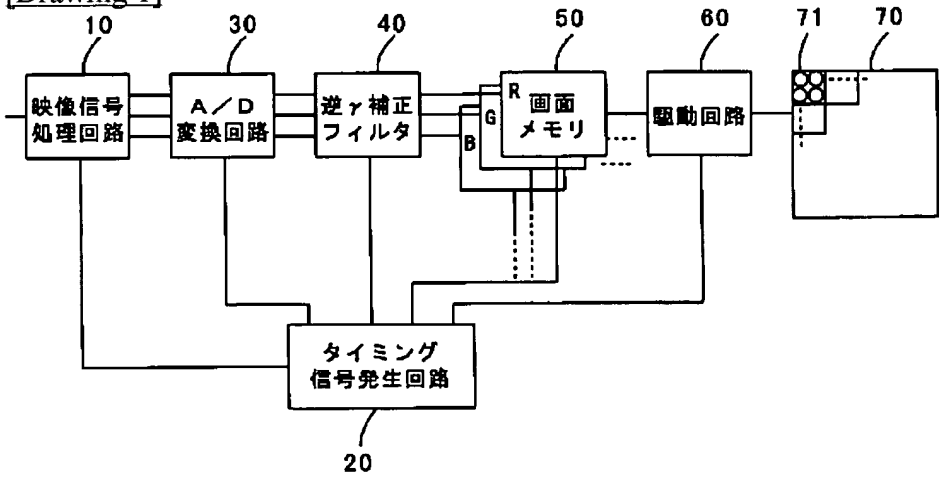
[Translation done.]

* NOTICES *

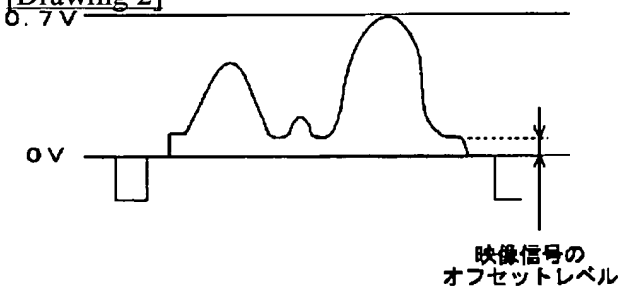
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

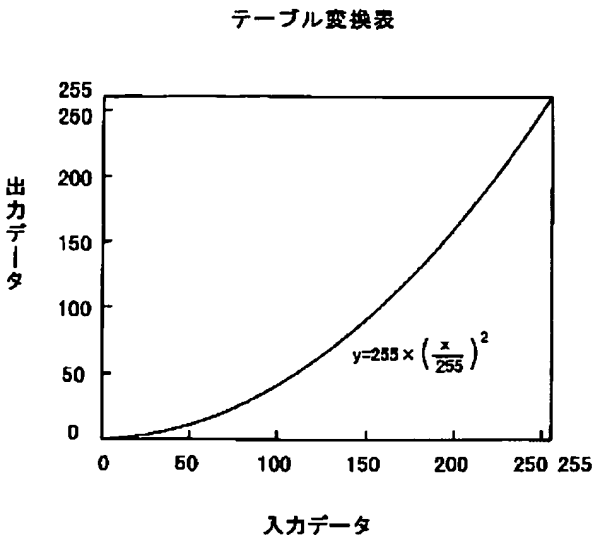
[Drawing 1]



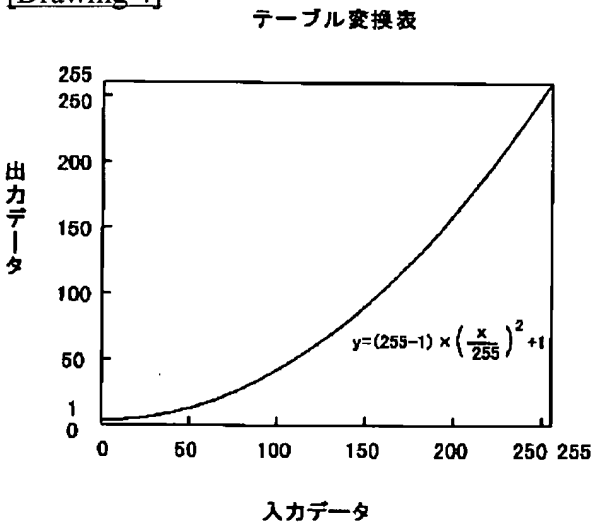
[Drawing 2]



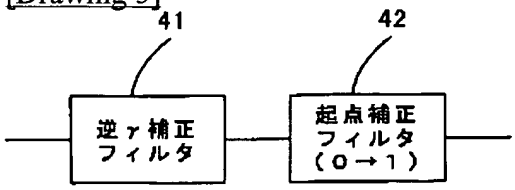
[Drawing 3]



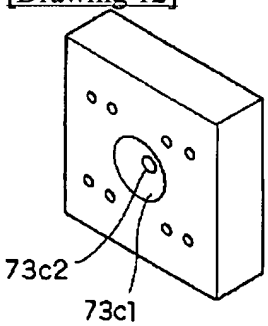
[Drawing 4]



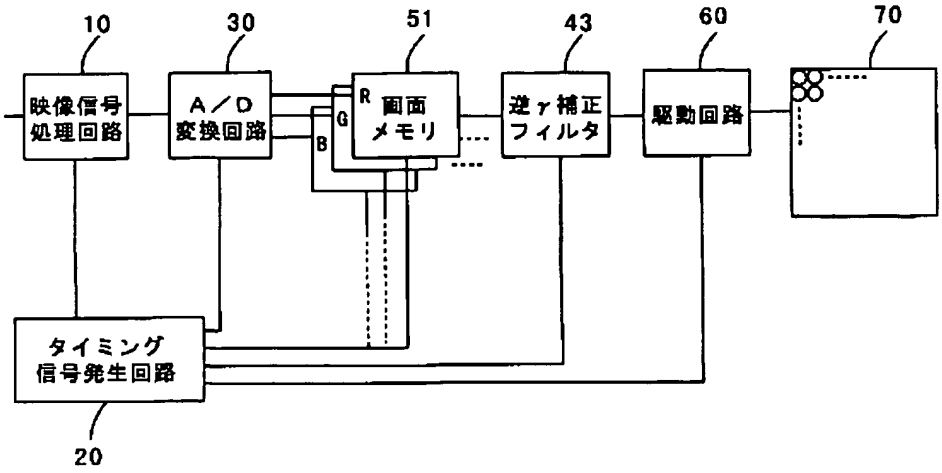
[Drawing 5]



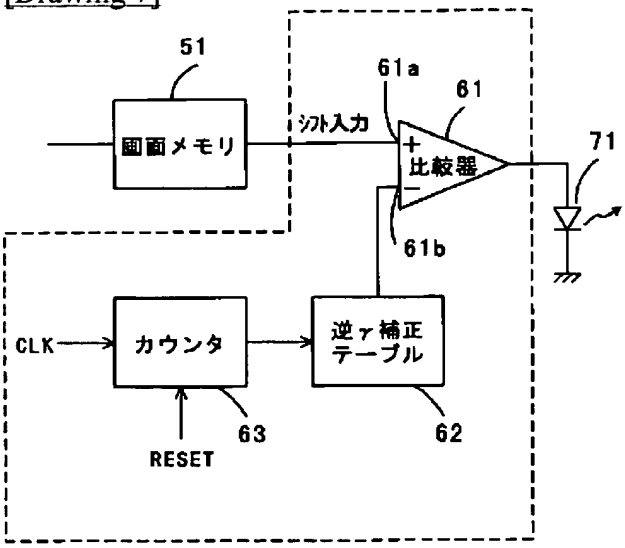
[Drawing 12]



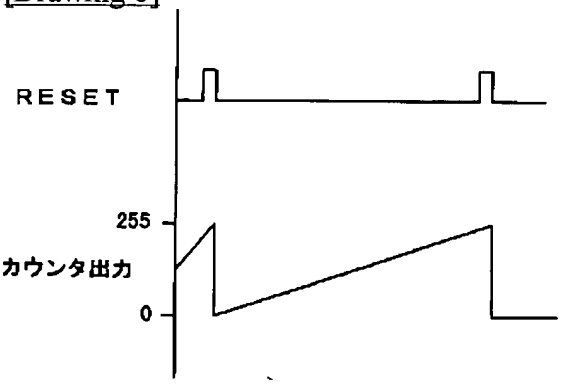
[Drawing 6]



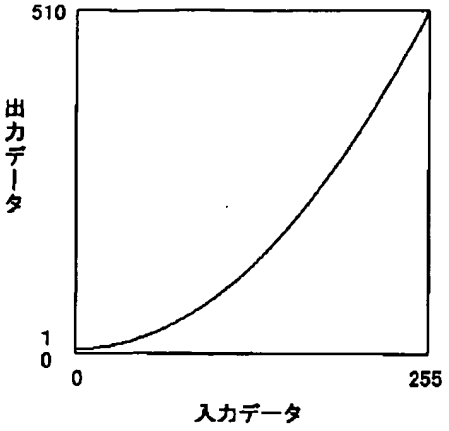
[Drawing 7]



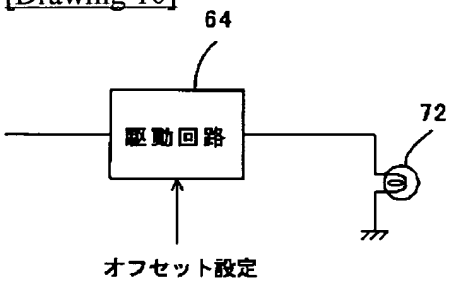
[Drawing 8]



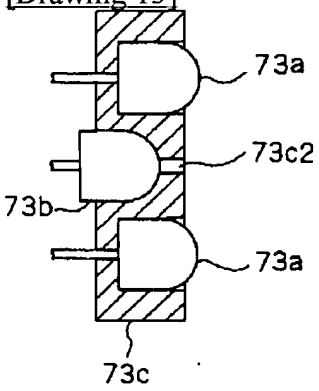
[Drawing 9]



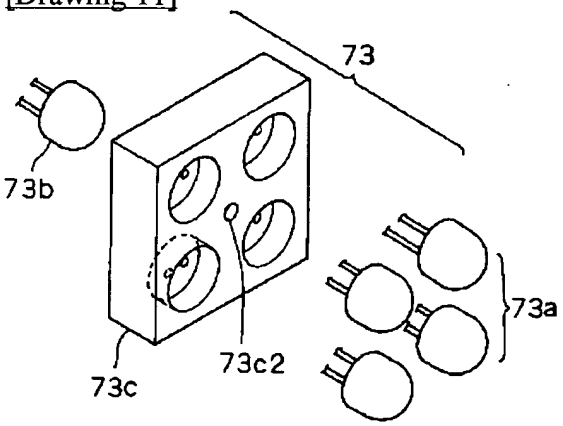
[Drawing 10]



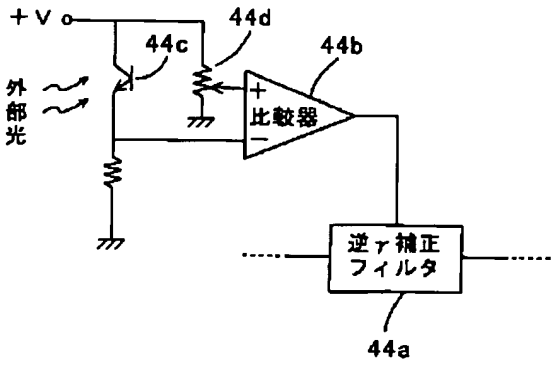
[Drawing 13]



[Drawing 11]



[Drawing 14]



[Translation done.]

* NOTICES *

EFFECT OF THE INVENTION

[Effect of the Invention] The display which can prevent this invention being colored a specific element color while a flicker is prevented, since it was made for the ratio of the condition of not switching on the light, and a burning condition not to serve as infinity, and becoming an unnatural image as explained above can be offered.
[0024] Moreover, according to invention concerning claim 2, the luminescence brightness c is given also at the time of original un-switching on the light, and it can realize at it. Furthermore, according to invention concerning claim 3, it can display and realize by the minimum brightness also about the input data showing the condition of not switching on the light. Furthermore, according to invention concerning claim 4, only the specified quantity is realizable with the very easy technique of making brightness increase uniformly. Furthermore, according to invention concerning claim 5, it can realize very simply only by making it there be no data which express the condition of not switching on the light, in the translation table of input data.
[0025] Furthermore, according to invention concerning claim 6, when the data showing the condition of not switching on the light are inputted, only the filter changed into the burning data of the predetermined minimum brightness can realize. Furthermore, according to invention concerning claim 7, since the origin of quantization data is only set to "1", it can realize very simply also to the existing thing. Furthermore, since according to invention concerning claim 8 supplemental lighting is made to turn on and the minimum brightness is given to a display also in the condition of a pixel of not switching on the light, there is no need of adding a hand to the luminescence brightness of the existing light-emitting part material, and implementation becomes easy.
[0026] Furthermore, since it is made not to produce the condition of light-emitting part material of not switching on the light according to invention concerning claim 9 only when the reflective brightness of an extraneous light is below a predetermined value, width of face of contrast in case the reflective brightness of an extraneous light is beyond a predetermined value can be enlarged as much as possible. Furthermore, according to invention concerning claim 10, a flicker etc. can be prevented when being later displayed as an image by applying when quantizing a video signal.
[0027] Furthermore, according to invention concerning claim 11, the method of presentation which it is colored a specific element color and can be made not to become an unnatural image can be offered, a flicker preventing. Furthermore, according to invention concerning claim 12, the medium which recorded the display-control program which it is colored a specific element color and can be made not to become an unnatural image can be offered, a flicker preventing.
[0028]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing 1 shows the large-sized LED display equipment of the outdoor type which applied the indicating equipment concerning 1 operation gestalt of this invention with the outline block diagram, and drawing 2 shows the video signal of a composite inputted into the LED display equipment concerned by the wave form chart.
[0029] In this drawing, the video-signal processing circuit 10 outputs a synchronizing signal to the timing signal generating circuit 20 while it inputs the video signal of a composite and outputs the primary color drive signal of RGB. The timing signal generating circuit 20 generates the timing signal to each circuit later mentioned based on the input timing of a synchronizing signal, and has generated the timing signal for sampling and carrying out A/D conversion to the A/D-conversion circuit 30 where each primary color drive signal of RGB is inputted.
[0030] It has the A/D-conversion circuit 30 for every primary color drive signal of RGB, it samples the primary color drive signal serially inputted as an analog signal based on the above-mentioned timing signal, and changes it into a 8-

bit digital signal. Although the offset level of an original video signal as shown in drawing 2 also in a primary color drive signal is given, when 8 bits considers as 256 gradation in this way, in order to raise resolution, this offset level is deducted. Therefore, in order to make contrast of a former image effective in the maximum, brightness will show [brightness] the maximum brightness condition of "255" level from the condition of "0" level of not switching on the light.

[0031] The conversion result by the A/D-conversion circuit 30 is recorded on the screen memory 50 by which the conversion result is prepared in each of RGB for every frame, after being inputted into the reverse gamma amendment filter 40 for returning the signal which was sent from the transmitting side and of which gamma amendment was done and making predetermined conversion according to the timing signal from the timing signal generating circuit 20. The reverse gamma amendment filter 40 consists of ROMs, and outputs the data memorized to this address to the 8-bit address input. Although this data supports the so-called signal of which gamma amendment was done, in this invention, it is different from the existing reverse gamma amendment so that it may mention later. In addition, the timing signal is inputted into the screen memory 50 from the timing signal generating circuit 20 mentioned above, a predetermined memory address is specified with an internal counter, and data are memorized by this memory address.

[0032] And based on the data memorized by this screen memory 50, the actuation circuit 60 drives LED71 of a display panel 70. This LED71 is formed as one unit for every pixel, and is prepared [Midori / blue and] one [at a time] two about red. Although red luminescence brightness is because it is low compared with other two colors, this can be suitably changed about the configuration of each pixel, and may constitute a display panel 71 from one chip by LED which can be displayed full color. Although the actuation circuit 60 adjusts the brightness of each LED71, in the case of this operation gestalt, it is adjusting by the time amount ratio of a burning condition and a putting-out-lights condition. That is, an intensity level is always turned on in the state of the max of "255", and is always un-switching on the light in the state of the min of an intensity level "0." In addition, since the blinking condition for adjusting brightness has the very high repeat frequency, a flicker does not pose a problem at all. In addition, it is determined by the timing signal from the timing signal generating circuit 20 which also mentioned above the decision of the timing of the burning condition in this case, and a putting-out-lights condition.

[0033] Although brightness is adjusted by the time amount ratio of a burning condition and a putting-out-lights condition in this operation gestalt, it is good also as a configuration using the light-emitting part material which carries out analogue conversion of the digital data showing brightness, and adjusts brightness with an analog voltage value.

Here, the reverse gamma amendment filter 40 mentioned above is explained. The video-signal electrical-potential-difference (V1) pair display brightness (S) property in the Braun tube the gamma amendment itself S=V1 **2.2 -- (1)

It is the amendment which comes out and is performed by signal output sides, such as a television broadcasting station side, according to being. V1 = V0 ** (-2.2) -- (2)

Amendment is performed based on the becoming relational expression. If it is made to display with the Braun tube based on the video-signal electrical potential difference to which this gamma amendment was performed, the relation of the original video-signal electrical-potential-difference (V0) pair display brightness (S) will become linear.

Therefore, when it has displays other than the Braun tube (a light emitting diode, a plasma display panel, liquid crystal, etc.), it is. S=V0 ** (-2.2) -- (3)

Since it becomes, reverse gamma amendment is needed. For example, if a video-signal electrical-potential-difference pair brightness property is linear, it is the output video-signal electrical potential difference VOUT. Relation of the input video-signal electrical potential difference VIN VOUT =VIN**2.2 -- (4)

Then, it is good.

[0034] Drawing 3 shows the content of the translation table at the time of presupposing that the reverse gamma amendment temporarily shown in (4) types is applied. An axis of abscissa X is used as input data, an axis of ordinate Y is used as the output data after amendment, and it is conversion in the case of 256 gradation. Y=255(X/255) **2 -- (5)

It matches with the becoming simple relational expression. However, in such response relation, when output-data Y is "0", LED71 will be in the condition of not switching on the light, and when output-data Y is "1", LED71 will be in a burning condition. When it quantizes by having excepted below the offset level of the video signal shown in drawing 2 and is made into "0" near the offset level of a video signal, output-data Y will be set to "0" by the noise in a video signal etc., or it will be set to "1." If luminescence brightness [of LED71 in case output-data Y is "1"] a [a candela/square meter], and reflective brightness b [a candela/square meter] by the extraneous light, when output-data Y is "0", it is set to b [a candela/square meter], and when output-data Y is "1", it will become [(a+b) a candela/square

meter]. A problem does not have the reflective brightness b by the extraneous light to some extent like day ranges for those who in a certain case see even if output-data Y is set to "0" or is set to "1", since this ratio is small. However, when night comes and the extraneous light has fallen, even if it compares with the minimum brightness of LED71, it becomes the forge fire which can fully be disregarded. In this case, the contrast ratio when output-data Y being set to "0", or being set to "1" becomes very large. Since the frequency which repeats blinking in order to adjust brightness, as mentioned above is very high, a flicker becomes satisfactory, but since fluctuation of output-data Y is performed per frame, its frequency is low and can fully sense it by human being's eyes. Then, the more the surroundings become dark, the more a flicker comes to clarify.

[0035] On the other hand, even if it changes output-data Y between "1" and "2", this does not pose a problem at all. When output-data Y is "2", supposing it becomes [(2 a+b) a candela/square meter], even if the reasons which do not pose a problem are [(a+b) a candela/square meter] when output-data Y is "1", and the reflective brightness b of an extraneous light is "0", a brightness ratio serves as two times. As [show / this operation gestalt / in drawing 4 / since it is such, do not adopt the transformation of (5) types, but] Y= (255-1) and (X/255) **2+1 -- (6)

The becoming transformation is adopted and it is recording on the reverse gamma amendment filter 40. (6) When the brightness range in LED71 which can be adjusted is the "255" level from "0" level, even if a formula is the minimum value, it means that the brightness of "1" level is given and the brightness of LED71 changes, the fluctuation ratio will be settled in the comparatively small range of about several times.

[0036] Next, actuation of this operation gestalt which consists of the above-mentioned configuration is explained. If the video signal of the composite outputted through intermediate frequency processing etc. from a television tuner etc. is inputted into the video-signal processing circuit 10, this video-signal processing circuit 10 will be changed and outputted to the primary color drive signal of RGB based on the video signal inputted serially while it outputs a synchronizing signal to the timing signal generating circuit 20. A/D conversion of the primary color drive signal of each color is carried out in the A/D-conversion circuit 30 to the sampling timing according to the arrangement situation of LED71 in a display panel 70. At this event, it is changed as linear digital value to the pure reinforcement in a video signal.

[0037] The conversion result of the A/D-conversion circuit 30 serves as an address input of the reverse gamma amendment filter 40 which consists of ROMs, serves as data with which the translation data memorized to this address expresses the brightness of each pixel, and is memorized to the predetermined address of the screen memory 50. It is either of the "1" level - "255" level, and the so-called condition of "0" level of not switching on the light is not generated as the brightness value changed here is shown in drawing 4 . Of course, although the condition of not switching on the light has arisen in strict semantics since the brilliance control of LED71 itself is carrying out by the time amount ratio of a burning condition and a putting-out-lights condition, the condition in the semantics whether it is detectable with human being's vision of not switching on the light does not arise.

[0038] Consequently, as for the luminescence brightness of LED71, "1" level is secured even if it is a case so that brightness may be set to "0", when an offset level is taken into consideration as that into which a video signal as shown in drawing 2 is inputted. On the other hand, when a noise takes a video signal, fluctuation arises also to the primary color drive signal inputted into the A/D-conversion circuit 30. The output data of this reverse gamma amendment filter 40 are only changed with the value more than "1", and seem therefore, for a fluctuation ratio not to become infinite although the input data of the reverse gamma amendment filter 40 is changed in a dark part. Even if this fluctuation is night, it does not give great not fluctuation but sensation which flickers for those who are looking at the display panel 70.

[0039] On the other hand, the secondary effect of this gives the further effectiveness of losing unnatural coloring. When a primary color drive signal is conventionally generated based on a video signal, the variation between each color of RGB will arise. If it is the range which can permit the variation between each color, the variation itself cannot be sensed being the same as that of the case of the brightness ratio mentioned above, either, but red emits light, and if the brightness ratio between each color serves as infinity, green and blue will sense coloring certain, as light is not emitted. For example, suppose that human being's head was reflected in the image. In this case, since the pixel of the hair part of hair expresses black, brightness becomes low, and red presupposes that "1" and green are ["1" and blue] original brightness "1." At this time, even if it will be in the condition "1" That only red was set to "2" and increased in number rather than the brightness of green or blue by gap of balance, the difference of balance is hard to sense. However, in that only red is in the condition of "1" Having increased from the brightness of green or blue, if "1" and green are set to

"0" and blue is set to "0", although red is the same, as for the part of the hair of hair, he will look red under the effect of the brightness ratio of infinity.
[0040] On the other hand, since the output data of the reverse gamma amendment filter 40 are "1" at least, the unnaturalness to which a specific color is attached to a dark color part is avoided. When the data with which reverse gamma amendment which set the origin of brightness to "1" for every pixel of RGB each color was performed are written in, the actuation circuit 60 makes the rate of the burning period of LED71 and putting-out-lights period in a display panel 70 change according to these data. Thereby, the luminescence brightness of LED71 becomes a thing proportional to the brightness of the original photographic subject.
[0041] By the way, about conversion of (6) types, and the LED display equipment shown in drawing 1 , it is only 1 operation gestalt of this invention. In case a video signal etc. is quantized, also in order to secure the width of face of contrast, the view of this invention does not prepare a fluctuation region where a brightness ratio becomes infinity from a putting-out-lights condition to it being the conventional view which is considered as the range to the maximum brightness condition. As the example, it is made to set an origin in the case of (6) types to "1" as a gradation value of quantization. In this case, although carried out to covering a reverse gamma amendment filter and coincidence, it is not necessary to necessarily carry out simultaneously. Drawing 5 shows the example equipped with the origin amendment filter 42 with the reverse gamma amendment filter 41 based on (5) types. A correction formula changes depending on the property of light-emitting part material. Therefore, it is also effective to carry out the filter which sets an origin to "1" about the reverse gamma amendment and quantization data with which the brightness property of light-emitting part material is compensated in the sense of a wide sense according to an individual.
[0042] Moreover, after writing in the usual quantization data to the screen memory 51, it is also effective to perform conversion shown in (6) types. Drawing 6 shows the outline configuration of the LED display equipment in such a case, and after it changes into the reverse gamma amendment filter 43, covering the reading data from the screen memory 51, it has inputted it into the actuation circuit 60. On the other hand, if a certain amendment is not necessarily applied to quantization data, it may be unable to realize. Drawing 7 shows the example realized without processing it in any way to the quantization data itself. The data quantized after the screen memory 51 had deducted the offset level from the primary color drive signal etc. like what is shown in drawing 6 are written in. This data carrying out 1 bit shift of the data, it turns ON the least significant 1 bit, and is made to increase it to "two times +1" by this input edge 61a here, although while is inputted into input edge 61a in the comparator 61. On the other hand, the output data of the reverse gamma amendment table 62 which consists of ROMs are inputted into input edge 61b of another side in this comparator 61, and the count output of the 8-bit counter 63 is inputted as an address input of this reverse gamma amendment table 62. Since Clock CLK is inputted into a counter 63 and reset input is applied every 256 clock CLK, the counter output has been repeatedly counted in "0-255", as shown in drawing 8 . Drawing 9 showed the content of storage of the above-mentioned reverse gamma amendment table 62, and the content was the same as that of the case of (5) types, and had merely carried out two times as data.
[0043] That is, the output data of the screen memory 51 serve as "two times +1", and are compared with the data which carried out the "two times" of what did reverse gamma amendment of the count output of Clock CLK. Consequently, even if it is data of "0" level as brightness, it will be in the condition that the "1" was added, and a burning period is amended further at the period to which reverse gamma amendment was applied. [minimum] It can consider as relation as substantially shown in drawing 4 , without processing quantization data by having such a comparator 61, the reverse gamma amendment table 62, and a counter 63 in an actuation circuit.
[0044] Moreover, it is also possible to enable setting out of the amount of offset in the actuation circuit 64, as for the purpose of not preparing a fluctuation region where a brightness ratio becomes infinity shows to drawing 10 , and to consider as the configuration to which the brightness according to the amount of the said offset is made to increase uniformly. In this case, what is necessary is just to establish the period turned on regardless of data, if it is LED71, and you may make it impress the electrical potential difference according to the amount of offset to the luminescence bulb 72 which has a filament as shown in this drawing 10 . As this example also shows, as light-emitting part material, it is not restricted to LED71, and a controllable member can be used for luminescence brightness in the range of predetermined brightness from the conditions of not switching on the light, such as the luminescence bulb 72.
[0045] although he is trying for a brightness ratio not to serve as infinity until now about the light-emitting part material itself turned on based on quantization data, the pixel flickers for the side to see -- it is able for a ****** to pose a problem and to think as a pixel. For this reason, although intensity control special to LED73a of RGB each color

is not performed, apart from these, he prepares white LED73b, and is trying to give the minimum brightness by making this LED73b always turn on in the LED unit 73 shown in drawing 11 - drawing 13 .
[0046] In order to hold the protection-from-light nature between positioning and each color, this LED unit 73 inserted each LED73b from the transverse-plane side, and is equipped with fixable substrate 73c. Although the conventional substrate only equips with LED of RGB from a transverse-plane side, white LED73b is inserted in a part for a tooth-back center section about this substrate 73c, the fixable maintenance hole 73c1 is formed, and this maintenance hole 73c1 has formed the breakthrough 73c2 towards the transverse-plane side. This breakthrough 73c2 is formed more smallish, in order to adjust the luminescence brightness of LED73b, and it will emit light by the brightness at the time of giving "1" as brightness data to each LED73a of RGB.
[0047] In this configuration, white LED73b is always turned on. Since the minimum brightness of the amount of offset will be given to the brightness range of the conventional condition changing from a putting-out-lights condition in the range of the maximum brightness, it stops therefore, producing the field where a brightness ratio becomes infinite in the fluctuation range. Moreover, to the control system by quantization data, a hand is not added at all, either, and modification is easy. Of course, it is not necessary to restrict to LED73b as always turned-on light-emitting part material, it has another source of lighting, and may be made to carry out a light guide. Furthermore, the source of lighting which illuminates the screen by low brightness may be prepared out of a display.
[0048] Moreover, although he is trying not to always produce the condition of not switching on the light, in LED71 etc. until now, if it is in the condition which the reflective brightness b of an extraneous light cannot say as "0", contrast will also become rich, so that the brightness range is large. Drawing 14 is equipped with reverse gamma amendment filter 44a which memorizes both table conversion tables shown in the table conversion table shown in drawing 3 instead of and drawing 4 , and is making either choose it as said reverse gamma amendment filter 44a with the output of comparator 44b. [the reverse gamma amendment filter 40 shown in drawing 1] Input voltage is changed by photo transistor 44c which detects external luminous intensity about one input edge of comparator 44b, and an electrical potential difference can be adjusted by 44d of variable resistance about the input edge of another side. This photo transistor 44c is exposed outside, in order to detect external luminous intensity.
[0049] By considering as this configuration, if external luminous intensity is weak, the current which flows photo transistor 44c will become small, and the input voltage to comparator 44b will become low. Then, as compared with the electrical-potential-difference value set as the input edge of another side by 44d of variable resistance, it becomes small, and the output signal showing this comparison result makes the table conversion table shown in drawing 4 to reverse gamma amendment filter 44a choose. On the other hand, if external luminous intensity is strong, the current which flows photo transistor 44c will become large, and the input voltage to comparator 44b will become high. Then, since it becomes higher than the electrical-potential-difference value set as the input edge of another side by 44d of variable resistance, a comparison result is reversed and the table conversion table shown in drawing 3 to reverse gamma amendment filter 44a is made chosen.
[0050] Thus, when controlling the reinforcement of light-emitting part material, such as LED71, based on the data which quantized the video signal etc. and displaying an image Since it was made not to produce a field where processing to which the origin of quantization is changed to "1" from "0" is performed, and a brightness ratio becomes infinite in the fluctuation range of brightness with the reverse gamma amendment filter 40 which performs reverse gamma amendment etc., While a feeling of a flicker is lost, the unnatural coloring generated by gap of the balance between each element color can be avoided.

[Translation done.]

IDS #6

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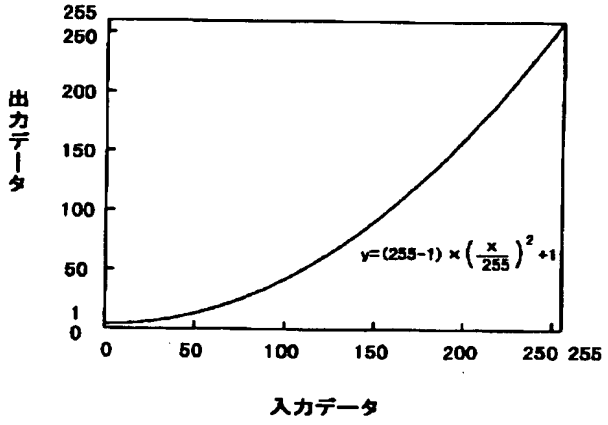
(54)【発明の名称】　表示装置、表示方法および表示制御プログラムを記録した媒体

(57)【要約】
【課題】　夜間、ちらついたり、不自然な着色が付されてしまうことが多かった。
【解決手段】　映像信号などを量子化したデータに基づいてＬＥＤ７１などの発光部材の強度を制御して映像を表示する場合に、逆γ補正などを行なう逆γ補正フィルタ４０にて量子化の起点を「０」から「１」に変化させる処理を行なうなどして、輝度の変動範囲において輝度比が無限大となるような領域を生じないようにしたため、ちらつき感がなくなるとともに、各要素色間のバランスのずれによって発生していた不自然な着色を回避することができるようになる。

テーブル変換表



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【特許請求の範囲】

【請求項１】　画素の輝度を量子化した入力データに基づいて平面状に配置された発光部材の発光輝度を制御して画素表示する表示装置であって、量子化データに基づく発光輝度ａ、外部光による反射輝度ｂとして、本来の不点灯状態と点灯状態との比がｂ：ａ＋ｂで表されるときに、この比が無限大とならないように不点灯状態を制御することを特徴とする表示装置。

【請求項２】　上記請求項１に記載の表示装置において、本来の不点灯時の発光輝度ｃとして、外部光の反射輝度ｂが低下したときに不点灯状態と点灯状態との比であるｂ＋ｃ：ａ＋ｂが無限大とならないようにすることを特徴とする表示装置。

【請求項３】　画素の輝度を量子化した入力データに基づいて平面状に配置された発光部材の発光輝度を制御して画素表示する表示装置であって、不点灯状態を表す入力データについても最小限の輝度で表示することを特徴とする表示装置。

【請求項４】　上記請求項１～請求項３のいずれかに記載の表示装置において、上記発光部材における輝度を一律に所定量だけ増加させることを特徴とする表示装置。

【請求項５】　上記請求項１～請求項４のいずれかに記載の表示装置において、上記入力データを変換する変換テーブルを有するとともに、同変換テーブルには不点灯状態を表すデータを備えないことを特徴とする表示装置。

【請求項６】　上記請求項１～請求項５のいずれかに記載の表示装置において、上記入力データを変換する変換フィルタを有するとともに、同フィルタは不点灯状態を表すデータを入力したときに所定の最小輝度の点灯データに変換することを特徴とする表示装置。

【請求項７】　上記請求項１～請求項６のいずれかに記載の表示装置において、量子化データの起点が「１」であることを特徴とする表示装置。

【請求項８】　上記請求項１～請求項７のいずれかに記載の表示装置において、上記発光部材に加えて補助照明を有し、同補助照明を点灯させて画素の不点灯状態においても最小の輝度を持たせることを特徴とする表示装置。

【請求項９】　上記請求項１～請求項８のいずれかに記載の表示装置において、外部光の反射輝度が所定値以上であるときに上記発光部材の不点灯状態を生じさせ、所定値以下であるときに上記発光部材の不点灯状態を生じさせないようにすることを特徴とする表示装置。

【請求項１０】　輝度を表す映像信号の変動範囲に対して発光部材における輝度調整可能な範囲に変換するために同映像信号を量子化データに変換しつつ、同量子化データに基づく上記発光部材に不点灯状態を生じさせないようにすることを特徴とする表示装置。

【請求項１１】　画素の輝度を量子化した入力データに

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基づいて平面状に配置された発光部材の発光輝度を制御して画素表示させる表示方法であって、量子化データに基づく発光輝度ａ、外部光による反射輝度ｂとして、本来の不点灯状態と点灯状態との比がｂ：ａ＋ｂで表されるときに、この比が無限大とならないように不点灯状態を制御することを特徴とする表示方法。

【請求項１２】　画素の輝度を量子化した入力データに基づいて平面状に配置された発光部材の発光輝度を制御して画素表示させる表示制御プログラムを記録した媒体であって、量子化データに基づく発光輝度ａ、外部光による反射輝度ｂとして、本来の不点灯状態と点灯状態との比がｂ：ａ＋ｂで表されるときに、この比が無限大とならないように不点灯状態を制御することを特徴とする表示制御プログラムを記録した媒体。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、画素の輝度を量子化した入力データに基づいて平面状に配置された発光部材の発光輝度を制御して画素表示する表示装置と表示方法と表示制御プログラムを記録した媒体に関する。

【０００２】

【従来の技術】従来、この種の表示装置として、特開昭５９－２０８５８７号公報に示すものが知られている。同公報に開示された表示装置は、輝度制御可能な発光素子を平面状に配置しつつ、各発光素子の輝度を画素の輝度に応じて点灯制御させることにより、画素表示させている。この際、元の映像信号を６４段階に量子化して輝度制御しており、その最小輝度状態は不点灯状態となっている。

【０００３】

【発明が解決しようとする課題】上述した従来の表示装置においては、不点灯状態から最大輝度の点灯状態まで利用してコントラストの豊かな画像としている反面、本来の不点灯状態の近辺では、ノイズなどの影響を受けて不点灯状態と点灯状態とが微少な期間を経て繰り返す状態が生じ、映像を見る者にとっては暗い部分でちらつくように感じる。また、ＲＧＢの要素色間については、ある色については不点灯状態が安定し、他の色については ちらつくといったことが生じると、ちらつく部分については点灯状態となる要素色の色が付いてしまうことがある。すなわち、赤の要素色がちらついて他の要素色がちらつかないとすると、ちらつきはその部分に赤色を付すように作用し、不自然な感じを与えることになる。

【０００４】本発明は、上記課題にかんがみてなされたもので、ちらつきを無くし、不自然な着色を防止することが可能な表示装置、表示方法、及び表示制御プログラムを記録した媒体の提供を目的とする。

【０００５】

【課題を解決するための手段】上記目的を達成するため、請求項１にかかる発明は、画素の輝度を量子化した

入力データに基づいて平面状に配置された発光部材の発光輝度を制御して画素表示する表示装置であって、量子化データに基づく発光輝度ａ、外部光による反射輝度ｂとして、本来の不点灯状態と点灯状態との比がｂ：ａ＋ｂで表されるときに、この比が無限大とならないように不点灯状態を制御する構成としてある。

【０００６】上記のように構成した請求項１にかかる発明においては、画素の輝度を量子化した入力データに基づいて平面状に配置された発光部材の発光輝度を制御して画素表示するが、量子化データに基づく発光輝度ａ、外部光による反射輝度ｂとすると、各発光部材における不点灯状態と点灯状態との比はｂ：ａ＋ｂで表される。このときに、夜間ともなれば反射輝度ｂが限りなく「０」に近づくことになるから、この比は無限大となる。むろん、厳密に言えば夜間の反射輝度「ｂ」は０にはならないが、実質的にはこの比は無限大と言える。従って、ノイズなどによって不点灯状態と点灯状態とが繰り返されることになると無限大の輝度比によってちらつきがはっきりと見えてしまうことになる。しかるに、請求項１にかかる発明においては、この比が無限大とならないように不点灯状態を制御する。不点灯状態とそうでないときの輝度比が無限大とならないようにすれば、視覚的に大きな変化とならず、ちらつきは押さえられる。

【０００７】平面状に配置された発光部材はいわゆる二次元的にマトリクス状に配置されるものを意味しており、平坦面である必要はない。また、二次元的な配置についても直交格子点位置になければならないわけではない。量子化データには不点灯状態と点灯状態とが明確に区別されるのに対し、不点灯状態とそうでないときの輝度比が無限大とならないための具体的手法は各種の手法を適用可能である。その一例として、請求項２にかかる発明は、請求項１に記載の表示装置において、本来の不点灯時の発光輝度ｃとして、外部光の反射輝度ｂが低下したときに不点灯状態と点灯状態との比であるｂ＋ｃ：ａ＋ｂが無限大とならないようにする構成としてある。

【０００８】上記のように構成した請求項２にかかる発明においては、量子化データに基づけば、本来、不点灯となる時であっても、何らかの発光状態として発光輝度ｃとなることにより、外部光の反射輝度ｂが低下した場合でも、不点灯状態と点灯状態との比であるｂ＋ｃ：ａ＋ｂは無限大とならない。すなわち、量子化データでは不点灯状態であっても発光状態とすることにより、無限大となることを防止している。

【０００９】また、同様の考え方による他の一例として、請求項３にかかる発明は、画素の輝度を量子化した入力データに基づいて平面状に配置された発光部材の発光輝度を制御して画素表示する表示装置であって、不点灯状態を表す入力データについても最小限の輝度で表示する構成としてある。上記のように構成した請求項３にかかる発明においても、画素の輝度を量子化した入力データに基づいて平面状に配置された発光部材の発光輝度を制御して画素表示するが、不点灯状態を表す入力データについても最小限の輝度で表示する。これにより、完全な不点灯状態はなくなり、入力データ的には不点灯状態となるときの最小限の輝度と点灯状態との最小限の輝度との間の比は無限大とならなくなる。

【００１０】以上のように、入力データ的には不点灯状態となるときの輝度と点灯状態での最小限の輝度との比が無限大とならなくするための具体的な手法は各種のものを採用できる。その一例として、請求項４にかかる発明は、請求項１～請求項３のいずれかに記載の表示装置において、上記発光部材における輝度を一律に所定量だけ増加させる構成としてある。上記のように構成した請求項４にかかる発明においては、発光部材における輝度を一律に所定量だけ増加させることにより、入力データが不点灯状態を示すものであっても増加された輝度によって点灯状態となる。この輝度の増加はデータの段階で一律に増加させるものであっても良いし、発光部材におけるオフセット量として増加させるようなものでも良い。この場合、増加量が徐々に小さくなるような関数的な増加であっても構わない。

【００１１】さらに、請求項５にかかる発明は、請求項１～請求項４のいずれかに記載の表示装置において、上記入力データを変換する変換テーブルを有するとともに、同変換テーブルには不点灯状態を表すデータを備えない構成としてある。上記のように構成した請求項５にかかる発明においては、量子化データを扱うにあたって入力データを変換する変換テーブルを有するものであるときに、同変換テーブルによって入力データを変換することになるが、この変換テーブルが不点灯状態を表すデータを備えないことにより、変換後は必ず不点灯状態が無くなる。

【００１２】この場合の不点灯状態を表すデータとは、必ずしも「０」を表すものに限る必要はなく、発光部材の輝度を表すものとして不点灯状態の輝度を表すものであればよい。さらに、請求項６にかかる発明は、請求項１～請求項５のいずれかに記載の表示装置において、上記入力データを変換する変換フィルタを有するとともに、同フィルタは不点灯状態を表すデータを入力したときに所定の最小輝度の点灯データに変換する構成としてある。

【００１３】上記のように構成した請求項６にかかる発明においては、上記入力データを変換する変換フィルタを有しており、同フィルタに不点灯状態を表すデータを入力すると、所定の最小輝度の点灯データに変換され、その結果、発光部材は不点灯状態となることなく、最小輝度で点灯される。さらに、請求項７にかかる発明は、請求項１～請求項６のいずれかに記載の表示装置において、量子化データの起点が「１」である構成としてある。

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【００１４】従来は量子化データが「０」を起点としており、不点灯状態が生じているが、上記のように構成した請求項７にかかる発明においては、もともと、量子化データの起点が「１」であるがゆえに、不点灯状態を備えていないことになる。さらに、請求項８にかかる発明は、請求項１～請求項７のいずれかに記載の表示装置において、上記発光部材に加えて補助照明を有し、同補助照明を点灯させて画素の不点灯状態においても最小の輝度を持たせる構成としてある。

【００１５】上記のように構成した請求項８にかかる発明においては、上記発光部材に加えて補助照明を有しており、発光部材自身が量子化された入力データに基づいて不点灯状態となったとしても同補助照明を点灯させることにより、補助照明を点灯させて画素の不点灯状態においても表示装置の表示面は点灯状態との比が無限大にならないようにするための一定以上の輝度を持つことになる。さらに、請求項９にかかる発明は、請求項１～請求項８のいずれかに記載の表示装置において、外部光の反射輝度が所定値以上であるときに上記発光部材の不点灯状態を生じさせ、所定値以下であるときに上記発光部材の不点灯状態を生じさせないようにする構成としてある。

【００１６】不点灯状態と点灯状態との輝度比が無限大となるか否かは外部光の反射輝度が十分にある場合には問題にならないと言える。このため、上記のように構成した請求項９にかかる発明においては、外部光の反射輝度が所定値以上であるか否かに基づき、反射輝度が所定値以上のときには発光部材の不点灯状態を生じさせても問題はなく、一方、同反射輝度が所定値以下となって実質的な意味で不点灯状態と点灯状態の輝度比が無限大とならないように発光部材の不点灯状態を生じさせないようにする。

【００１７】画素の輝度を量子化した入力データに基づいて上述した不点灯状態を生じさせない処理は、輝度を表す映像信号を量子化する際の処理に対しても有効であり、その一例として、請求項１０にかかる発明は、輝度を表す映像信号の変動範囲に対して発光部材における輝度調整可能な範囲に変換するために同映像信号を量子化データに変換しつつ、同量子化データに基づく上記発光部材に不点灯状態を生じさせないようにする構成としてある。

【００１８】上記のように構成した請求項１０にかかる発明においては、本来の量子化にあたっては最大のコントラストを得るためにも輝度範囲を有効に量子化するが、この場合にも不点灯状態は生じさせないようにすることにより、不点灯状態と点灯状態との間で生じる無限大の輝度の比の状態が無くなり、ちらつきが押さえられる。また、量子化した入力データに基づいて上述した不点灯状態を生じさせない手法は、実体のある装置に限定される必要はなく、その方法としても機能することは容

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易に理解できる。このため、請求項１１にかかる発明は、画素の輝度を量子化した入力データに基づいて平面状に配置された発光部材の発光輝度を制御して画素表示させる表示方法であって、量子化データに基づく発光輝度ａ、外部光による反射輝度ｂとして、本来の不点灯状態と点灯状態との比がｂ：ａ＋ｂで表されるときに、この比が無限大とならないように不点灯状態を制御する方法として構成してある。

【００１９】すなわち、必ずしも実体のある装置に限らず、その方法としても有効であることに相違はない。ところで、上述したように、このような表示装置は単独で存在する場合もあるし、ある機器に組み込まれた状態で利用されることもあるなど、発明の思想としては各種の態様を含むものであり、ソフトウェアであったりハードウェアであったりするなど、適宜、変更可能である。発明の思想の具現化例として表示装置を制御するソフトウェアとなる場合には、かかるソフトウェアを記録した記録媒体上においても当然に存在し、利用されるといわざるをえない。

【００２０】その一例として、請求項１２にかかる発明は、画素の輝度を量子化した入力データに基づいて平面状に配置された発光部材の発光輝度を制御して画素表示させる表示制御プログラムを記録した媒体であって、量子化データに基づく発光輝度ａ、外部光による反射輝度ｂとして、本来の不点灯状態と点灯状態との比がｂ：ａ＋ｂで表されるときに、この比が無限大とならないように不点灯状態を制御する構成としてある。

【００２１】むろん、その記録媒体は、磁気記録媒体であってもよいし光磁気記録媒体であってもよいし、今後開発されるいかなる記録媒体においても全く同様に考えることができる。また、一次複製品、二次複製品などの複製段階については全く問う余地無く同等である。その他、供給方法として通信回線を利用して行う場合でも本発明が利用されていることには変わりないし、半導体チップに書き込まれたようなものであっても同様である。

【００２２】さらに、一部がソフトウェアであって、一部がハードウェアで実現されている場合においても発明の思想において全く異なるものはなく、一部を記録媒体上に記録しておいて必要に応じて適宜読み込まれるような形態のものとしてあってもよい。

【００２３】

【発明の効果】以上説明したように本発明は、不点灯状態と点灯状態との比が無限大とならないようにしたため、ちらつきが防止されるとともに、特定の要素色に着色されて不自然な画像となることを防止することが可能な表示装置を提供することができる。

【００２４】また、請求項２にかかる発明によれば、本来の不点灯時にも発光輝度ｃを与えて実現できる。さらに、請求項３にかかる発明によれば、不点灯状態を表す入力データについても最小限の輝度で表示して実現でき

る。さらに、請求項４にかかる発明によれば、所定量だけ一律に輝度を増加させるという極めて容易な手法によって実現できる。さらに、請求項５にかかる発明によれば、入力データの変換テーブルにおいて不点灯状態を表すデータがないようにするだけで極めて簡易に実現できる。

【００２５】さらに、請求項６にかかる発明によれば、不点灯状態を表すデータを入力したときに所定の最小輝度の点灯データに変換するフィルタだけで実現できる。さらに、請求項７にかかる発明によれば、量子化データの起点を「１」とするだけであるので、既存のものに対しても極めて簡易に実現できる。さらに、請求項８にかかる発明によれば、補助照明を点灯させて画素の不点灯状態においても表示装置に最小の輝度を持たせるので、既存の発光部材の発光輝度に手を加える必要が無く、実現が容易になる。

【００２６】さらに、請求項９にかかる発明によれば、外部光の反射輝度が所定値以下であるときにだけ発光部材の不点灯状態を生じさせないようにするため、外部光の反射輝度が所定値以上であるときのコントラストの幅を可能な限り大きくすることができる。さらに、請求項１０にかかる発明によれば、映像信号を量子化する場合に適用することによって後に映像として表示されるときにちらつきなどを防止することができる。

【００２７】さらに、請求項１１にかかる発明によれば、ちらつきが防止しつつ、特定の要素色に着色されて不自然な画像とならないようにすることが可能な表示方法を提供することができる。さらに、請求項１２にかかる発明によれば、ちらつきが防止しつつ、特定の要素色に着色されて不自然な画像とならないようにすることが可能な表示制御プログラムを記録した媒体を提供することができる。

【００２８】

【発明の実施の形態】以下、図面にもとづいて本発明の実施形態を説明する。図１は、本発明の一実施形態にかかる表示装置を適用した屋外用の大型ＬＥＤ表示装置を概略ブロック図により示しており、図２は当該ＬＥＤ表示装置に入力されるコンポジットのビデオ信号を波形図により示している。

【００２９】同図において、映像信号処理回路１０はコンポジットのビデオ信号を入力し、ＲＧＢの原色ドライブ信号を出力するとともに、同期信号をタイミング信号発生回路２０に出力する。タイミング信号発生回路２０は同期信号の入力タイミングに基づいて後述する各回路へのタイミング信号を発生するものであり、例えば、ＲＧＢの各原色ドライブ信号が入力されるＡ／Ｄ変換回路３０に対してはサンプリングしてＡ／Ｄ変換させるためのタイミング信号を発生している。

【００３０】Ａ／Ｄ変換回路３０はＲＧＢの各原色ドライブ信号ごとに備えられており、アナログ信号として逐

次入力されている原色ドライブ信号を上記タイミング信号に基づいてサンプリングし、８ビットのデジタル信号に変換する。原色ドライブ信号においても図２に示すような本来の映像信号のオフセットレベルが与えられているが、このように８ビットによって２５６階調とされた時点では解像度を向上させるために同オフセットレベルは差し引かれている。従って、元画像のコントラストを最大限に有効にするために輝度が「０」レベルの不点灯状態から輝度が「２５５」レベルの最大輝度状態を示すことになる。

【００３１】Ａ／Ｄ変換回路３０による変換結果は送信側から送られたγ補正された信号を元に戻すための逆γ補正フィルタ４０に入力され、タイミング信号発生回路２０からのタイミング信号に応じて所定の変換がなされた後、変換結果がＲＧＢのそれぞれに１フレーム毎に設けられている画面メモリ５０に記録されるようになっている。逆γ補正フィルタ４０はＲＯＭで構成されており、８ビットのアドレス入力に対して同アドレスに記憶されているデータを出力する。このデータはいわゆるγ補正した信号に対応しているが、本発明においては、後述するように既存の逆γ補正とは相違している。なお、画面メモリ５０には上述したタイミング信号発生回路２０からタイミング信号が入力されており、内部のカウンタにて所定の記憶アドレスが指定され、同記憶アドレスにデータが記憶される。

【００３２】そして、同画面メモリ５０に記憶されたデータに基づいて駆動回路６０が表示パネル７０のＬＥＤ７１を駆動する。このＬＥＤ７１は各画素毎に１ユニットとして設けられており、青と緑については１つずつ、赤については２つ設けられている。これは赤の発光輝度が他の２色に比べて低いためであるが、各画素の構成については適宜変更可能であって、１チップでフルカラー表示が可能なＬＥＤによって表示パネル７１を構成してもよい。駆動回路６０は各ＬＥＤ７１の輝度を調整するが、本実施形態の場合は点灯状態と消灯状態との時間比で調整している。すなわち、輝度レベルが「２５５」の最大状態で常時点灯となり、輝度レベル「０」の最小状態で常時不点灯となる。なお、輝度を調整するための明滅状態は繰り返し周波数が極めて高いため、ちらつきは全く問題とならない。なお、この場合の点灯状態と消灯状態のタイミングの決定も上述したタイミング信号発生回路２０からのタイミング信号によって決定されている。

【００３３】本実施形態においては点灯状態と消灯状態との時間比で輝度を調整しているが、輝度を表すディジタルデータをアナログ変換し、アナログ電圧値で輝度を調整する発光部材を利用する構成としても良い。ここで、上述した逆γ補正フィルタ４０について説明する。γ補正自体は、ブラウン管における映像信号電圧（Ｖ）対表示輝度（Ｓ）特性が

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$$S = V1 \ ^{**} 2.2$$

であるのに応じてテレビ放送局側等の信号出力側で施さ*

$$V1 = V0 \ ^{**} (-2.2)$$

なる関係式に基づいて補正が行われている。かかるγ補正が施された映像信号電圧に基づいてブラウン管で表示させれば元の映像信号電圧（Ｖ０）対表示輝度（Ｓ）の※

$$S = V0 \ ^{**} (-2.2)$$

となってしまうため、逆γ補正が必要となる。例えば、映像信号電圧対輝度特性が直線的なものであれば、出力★

$$VOUT = VIN^{**} 2.2$$

とすればよい。

【００３４】図３は仮に（４）式に示す逆γ補正を適用するとした場合の変換テーブルの内容を示している。横☆

$$Y = 255 (X/255)^{**} 2$$

なる簡略な関係式で対応づけている。しかしながら、このような対応関係では出力データＹが「０」のときにＬＥＤ７１は不点灯状態となり、出力データＹが「１」のときにＬＥＤ７１は点灯状態となる。図２に示す映像信号のオフセットレベル以下を除外して量子化を行い、映像信号のオフセットレベル近傍を「０」とした場合には、映像信号中のノイズなどによって出力データＹが「０」となったり「１」となったりすることになる。出力データＹが「１」の場合におけるＬＥＤ７１の発光輝度ａ［カンデラ／平方メートル］、外部光による反射輝度ｂ［カンデラ／平方メートル］とすると、出力データＹが「０」のときにｂ［カンデラ／平方メートル］となり、出力データＹが「１」のときに（ａ＋ｂ）［カンデラ／平方メートル］となる。昼間のように外部光による反射輝度ｂがある程度ある場合には、この比は小さいため、出力データＹが「０」となったり「１」となったりしても、見る者にとって問題はない。しかしながら、夜間となって外部光が低下してきた場合、ＬＥＤ７１の最◆

$$Y = (255-1) \cdot (X/255)^{**} 2+1 \quad \cdots (6)$$

なる変換式を採用し、逆γ補正フィルタ４０に記録している。（６）式はＬＥＤ７１における調整可能な輝度範囲が「０」レベルから「２５５」レベルであるときに、最小値であっても「１」レベルの輝度が与えられることを意味しており、ＬＥＤ７１の輝度が変化したとしてもその変動比は数倍程度という比較的小さな範囲に収まることになる。

【００３６】次に、上記構成からなる本実施形態の動作を説明する。テレビチューナなどから中間周波処理などを経て出力されるコンポジットのビデオ信号が映像信号処理回路１０に入力されると、この映像信号処理回路１０は同期信号をタイミング信号発生回路２０に出力するとともに、逐次入力されるビデオ信号に基づいてＲＧＢの原色ドライブ信号に変換して出力する。各色の原色ドライブ信号は表示パネル７０におけるＬＥＤ７１の配置状況に応じたサンプリングタイミングでＡ／Ｄ変換回路３０にてＡ／Ｄ変換される。この時点では映像信号にお

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…（１）

*れる補正であり、

…（２）

※関係が直線的となる。従って、ブラウン管以外の表示部（発光ダイオード、プラズマディスプレイパネル、液晶など）を有する場合には、

…（３）

★映像信号電圧ＶＯＵＴと入力映像信号電圧ＶＩＮの関係は、

…（４）

☆軸Ｘを入力データとし、縦軸Ｙを補正後の出力データとし、２５６階調の場合の変換を、

…（５）

◆小輝度と比較しても十分に無視できるほどとなる。この場合、出力データＹが「０」となったり「１」となったりしたときのコントラスト比は極めて大きくなる。上述したように輝度を調整するために明滅を繰り返す周波数は極めて高いためちらつきは問題なくなるが、出力データＹの変動はフレーム単位で行われるから、周波数が低く、人間の目によって十分に感知できる。すると、周りが暗くなればなるほどちらつきがはっきりしてくるようになる。

【００３５】一方、出力データＹが「１」と「２」の間で変動してもこれは全く問題とならない。問題とならない理由は、出力データＹが「１」のときに（ａ＋ｂ）［カンデラ／平方メートル］で、出力データＹが「２」のときに（２ａ＋ｂ）［カンデラ／平方メートル］となるとすると、外部光の反射輝度ｂが「０」であったとしても輝度比は二倍となるに過ぎない。本実施形態においては、このような理由から（５）式の変換式を採用せず、図４に示すような、

…（６）

ける純粋な強度に対してリニアなディジタル値として変換されている。

【００３７】Ａ／Ｄ変換回路３０の変換結果はＲＯＭで構成される逆γ補正フィルタ４０のアドレス入力となり、同アドレスに記憶されている変換データが各画素の輝度を表すデータとなって画面メモリ５０の所定アドレスに記憶される。ここで変換される輝度値は図４に示すとおり、「１」レベル～「２５５」レベルのいずれかであり、いわゆる「０」レベルの不点灯状態は発生していない。むろん、ＬＥＤ７１の輝度調整自体が点灯状態と消灯状態との時間比で行っているので、厳密な意味では不点灯状態が生じているが、人間の視覚で検知できるか否かという意味での不点灯状態が生じないのである。

【００３８】この結果、図２に示すような映像信号が入力されるものとしてオフセットレベルを考慮したときに輝度が「０」となるような場合であってもＬＥＤ７１の発光輝度は「１」レベルが確保される。一方、映像信号

にノイズがのった場合など、Ａ／Ｄ変換回路３０に入力される原色ドライブ信号にも変動が生じる。従って、暗い部分においては逆γ補正フィルタ４０の入力データが変動するが、同逆γ補正フィルタ４０の出力データは「１」以上の値で変動するだけであり、変動比が無限大となるようなことはない。この変動は夜間であったとしても表示パネル７０を見ている者にとっては大した変動ではなく、ちらつくような感覚を与えない。

【００３９】一方、これの副次的な影響は不自然な着色を無くすというさらなる効果を与える。従来、映像信号に基づいて原色ドライブ信号を生成した場合、ＲＧＢの各色間でのバラツキが生じてしまう。上述した輝度比の場合と同様、各色間でのバラツキが許容できる範囲であればバラツキ自体を感じることもできないのであるが、赤は発光し、緑と青は発光しないというように、各色間での輝度比が無限大となれば確実に着色を感じてしまうことになる。例えば、映像の中で人間の頭が映ったとする。この場合、髪の毛部分の画素は黒色を表すために輝度が低くなり、本来の輝度は赤が「１」、緑が「１」、青が「１」であるとする。このとき、バランスのずれによって、赤だけが「２」となって緑や青の輝度よりも「１」増えた状態となったとしてもバランスの差は感じられにくい。しかしながら、赤が「１」、緑が「０」、青が「０」となると、赤だけが緑や青の輝度よりも「１」増えた状態となっている点では同じであるのに、無限大の輝度比の影響によって髪の毛の部分は赤く見えてしまう。

【００４０】これに対し、逆γ補正フィルタ４０の出力データは少なくとも「１」であるため、暗色部分に特定の色が付いてしまう不自然さは回避される。ＲＧＢ各色の各画素ごとに輝度の起点を「１」とした逆γ補正が施されたデータが書き込まれると、駆動回路６０は同データに応じて表示パネル７０におけるＬＥＤ７１の点灯期間と消灯期間との割合を変更させる。これにより、ＬＥＤ７１の発光輝度は元の被写体の明るさに比例したものとなる。

【００４１】ところで、（６）式の変換や、図１に示すＬＥＤ表示装置については、本発明の一実施形態に過ぎない。映像信号等を量子化する際にはコントラストの幅を確保するためにも消灯状態から最大輝度状態までの範囲とするのが従来の考え方であるのに対し、輝度比が無限大になるような変動域を設けないのが本発明の考え方である。その一例として、（６）式の場合は量子化の階調値として起点を「１」とするようにしている。この場合、逆γ補正フィルタをかけるのと同時に行っているが、必ずしも同時に行う必要はない。図５は（５）式に基づく逆γ補正フィルタ４１とともに起点補正フィルタ４２を備える例を示している。発光部材の性質によっては補正式は変化する。従って、広義の意味で発光部材の輝度特性を補償する逆γ補正と量子化データについて起点を「１」とするフィルタとを個別にしておくのも有効である。

【００４２】また、画面メモリ５１に対して通常の量子化データを書き込んだ後で（６）式に示す変換を行うことも有効である。図６はそのような場合のＬＥＤ表示装置の概略構成を示しており、画面メモリ５１からの読み込みデータを逆γ補正フィルタ４３にかけて変換してから駆動回路６０に入力している。一方、必ずしも量子化データに何らかの補正をかけなければ実現できないわけではない。図７は量子化データ自身には何ら加工を施さないで実現する例を示している。画面メモリ５１は図６に示すものと同様に原色ドライブ信号などからオフセットレベルを差し引いた状態で量子化したデータが書き込まれている。このデータは比較器６１における一方の入力端６１ａに入力されているが、ここで同入力端６１ａではデータを１ビットシフトしつつ最下位の１ビットをオンにして「二倍＋１」に増加させている。一方、同比較器６１における他方の入力端６１ｂにはＲＯＭで構成される逆γ補正テーブル６２の出力データが入力されており、同逆γ補正テーブル６２のアドレス入力として８ビットのカウンタ６３のカウント出力が入力されている。カウンタ６３にはクロックＣＬＫが入力され、２５６クロックＣＬＫごとにリセット入力が加えられるので、カウンタ出力は図８に示すように「０～２５５」の範囲で繰り返しカウントされている。図９は上記逆γ補正テーブル６２の記憶内容を示しており、その内容は（５）式の場合と同様であってただデータとして二倍されたものとなっている。

【００４３】すなわち、画面メモリ５１の出力データは「二倍＋１」となっており、クロックＣＬＫのカウント出力を逆γ補正したものを「二倍」したデータと比較されるようになっている。この結果、輝度として「０」レベルのデータであっても最小限の「１」が付加された状態となり、さらに点灯期間は逆γ補正をかけた期間に補正される。このような比較器６１と逆γ補正テーブル６２とカウンタ６３とを駆動回路内に備えることにより量子化データを加工することなく実質的には図４に示すような関係とすることができる。

【００４４】また、輝度比が無限大になるような変動域を設けないという意味では図１０に示すように駆動回路６４にオフセット量を設定可能としておき、同オフセット量に応じた輝度を一律に増加させる構成とすることも可能である。この場合、ＬＥＤ７１であればデータと無関係に点灯する期間を設けておけばよいし、同図１０に示すようなフィラメントを有する発光バルブ７２にはオフセット量に応じた電圧を印加するようにしても良い。この例でも示すように発光部材としてはＬＥＤ７１に限られるものではなく、発光バルブ７２など不点灯状態から所定輝度の範囲で発光輝度を制御可能な部材を利用することができる。

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【００４５】これまでは、量子化データに基づいて点灯する発光部材自身について輝度比が無限大とならないようにしているが、見る側にとってはその画素がちらついたりするか否かが問題となるのであり、画素として考えることが可能である。このため、図１１～図１３に示すＬＥＤユニット７３では、ＲＧＢ各色のＬＥＤ７３ａには特別な輝度制御を行わないものの、これらとは別に白色のＬＥＤ７３ｂを設けておき、同ＬＥＤ７３ｂを常時点灯させることによって最小限の輝度を与えるようにしている。

【００４６】同ＬＥＤユニット７３は位置決めと各色間の遮光性を保持するために各ＬＥＤ７３ｂを正面側から挿入して固定可能な基板７３ｃを備えている。従来の基板は正面側からＲＧＢのＬＥＤを装着するだけであるが、この基板７３ｃについては背面中央部分に白色のＬＥＤ７３ｂを挿入して固定可能な保持穴７３ｃ１を形成してあり、同保持穴７３ｃ１は正面側に向けて貫通孔７３ｃ２を形成してある。この貫通孔７３ｃ２はＬＥＤ７３ｂの発光輝度を調整するために小さめに形成してあり、ＲＧＢの各ＬＥＤ７３ａに対して輝度データとして「１」を与えた場合の輝度で発光することになる。

【００４７】かかる構成において、白色のＬＥＤ７３ｂは常時点灯している。従って、従来の状態での輝度範囲が消灯状態から最大輝度の範囲で変化するのに対して、オフセット量の最小輝度が与えられることになるから、変動範囲で輝度比が無限大となる領域は生じなくなる。また、量子化データによる制御系に対しては何ら手を加えないものでもあり、変更が容易である。むろん、常時点灯する発光部材としてはＬＥＤ７３ｂに限る必要はなく、別の照明源を備えて導光するようにしてもよい。さらに、表示装置の外に表示面を低輝度で照明する照明源を設けてもよい。

【００４８】また、これまでは常にＬＥＤ７１などに不点灯状態を生じないようにしているが、外部光の反射輝度ｂが「０」とはいえない状態であれば、輝度範囲が大きいほどコントラストも豊かになる。図１４は、図１に示す逆γ補正フィルタ４０の代わりに、図３に示すテーブル変換表と図４に示すテーブル変換表の両方を記憶する逆γ補正フィルタ４４ａを備えており、比較器４４ｂの出力で同逆γ補正フィルタ４４ａにいずれか一方を選択させている。比較器４４ｂの一方の入力端については外部光の強度を検出するフォトトランジスタ４４ｃによって入力電圧が変動するようになっており、他方の入力端については可変抵抗４４ｄによって電圧を調整可能となっている。同フォトトランジスタ４４ｃは外部光の強度を検出するために外部に露出している。

【００４９】かかる構成とすることにより、外部光の強度が弱いとフォトトランジスタ４４ｃを流れる電流が小さくなって比較器４４ｂへの入力電圧が低くなる。すると、可変抵抗４４ｄによって他方の入力端に設定してある電圧値と比較して小さくなり、この比較結果を表す出力信号が逆γ補正フィルタ４４ａに対して図４に示すテーブル変換表を選択させる。これに対し、外部光の強度が強いとフォトトランジスタ４４ｃを流れる電流が大きくなって比較器４４ｂへの入力電圧が高くなる。すると、可変抵抗４４ｄによって他方の入力端に設定してある電圧値よりも高くなるので、比較結果は反転し、逆γ補正フィルタ４４ａに対して図３に示すテーブル変換表を選択させることになる。

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【００５０】このように、映像信号などを量子化したデータに基づいてＬＥＤ７１などの発光部材の強度を制御して映像を表示する場合に、逆γ補正などを行なう逆γ補正フィルタ４０にて量子化の起点を「０」から「１」に変化させる処理を行なうなどして、輝度の変動範囲において輝度比が無限大となるような領域を生じないようにしたため、ちらつき感がなくなるとともに、各要素色間のバランスのずれによって発生していた不自然な着色を回避することができるようになる。

【図面の簡単な説明】

【図１】本発明の一実施形態にかかる表示装置を適用した屋外用の大型ＬＥＤ表示装置の概略ブロック図である。

【図２】映像信号の波形図である。

【図３】従来の逆γ補正の変換テーブル内容を示すグラフである。

【図４】本発明の逆γ補正の変換テーブル内容を示すグラフである。

【図５】本発明の変形例にかかる要部ブロック図である。

【図６】本発明の他の変形例にかかる屋外用の大型ＬＥＤ表示装置の概略ブロック図である。

【図７】本発明の他の変形例にかかる要部ブロック図である。

【図８】同変形例にかかるタイミングチャートである。

【図９】同変形例にかかる逆γ補正テーブル内容を示すグラフである。

【図１０】本発明の他の変形例にかかる要部ブロック図である。

【図１１】本発明の他の変形例にかかるＬＥＤユニットの分解斜視図である。

【図１２】同変形例にかかるＬＥＤユニットの基板の背面側斜視図である。

【図１３】同変形例にかかるＬＥＤユニットの断面図である。

【図１４】本発明の他の変形例にかかる要部ブロック図である。

【符号の説明】

１０…映像信号処理回路

２０…タイミング信号発生回路

３０…Ａ／Ｄ変換回路

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４０…逆γ補正フィルタ
５０…画面メモリ
６０…駆動回路

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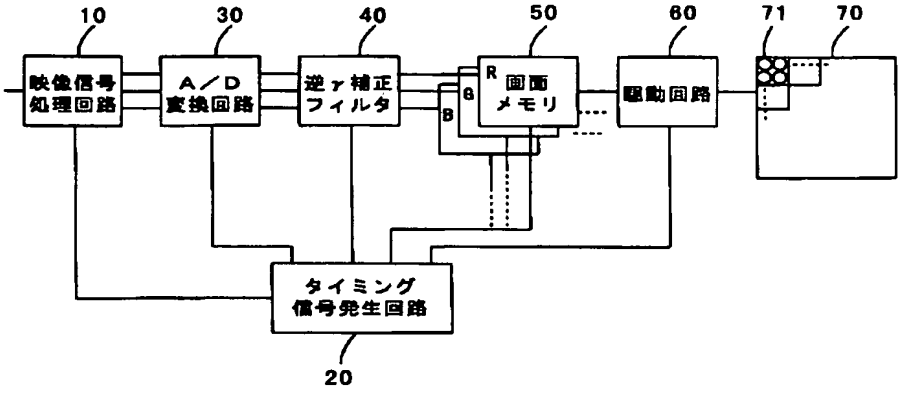
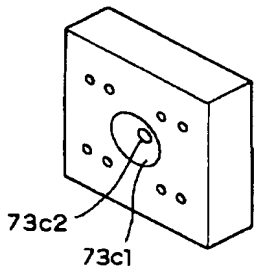
＊７０…表示パネル
７１…ＬＥＤ

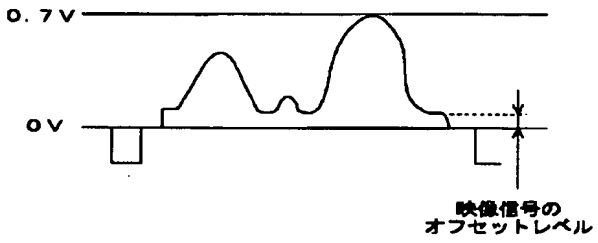
【図１】



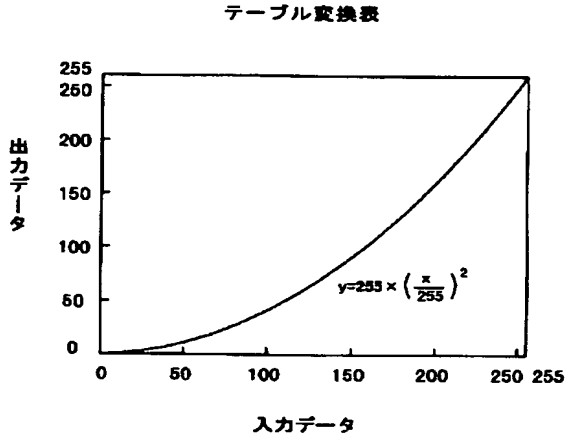
【図１２】



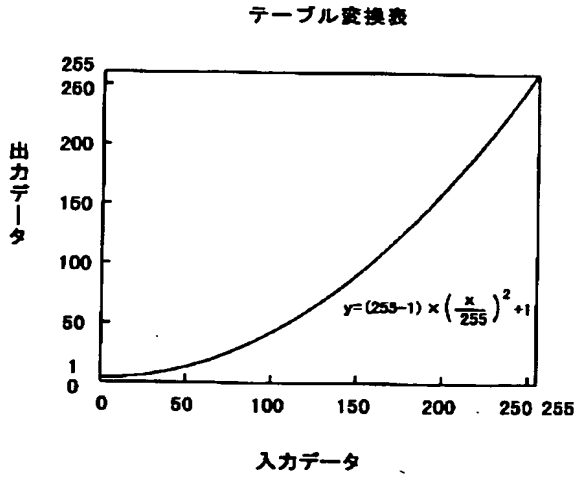
【図２】



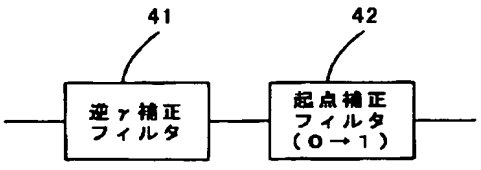
【図３】



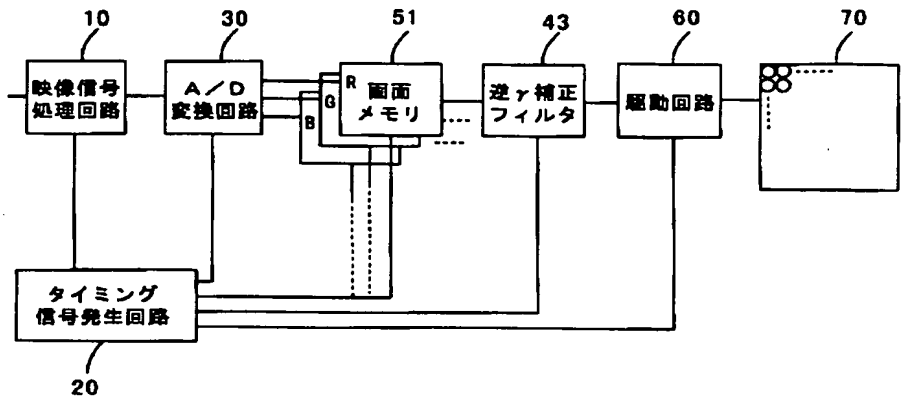
【図４】



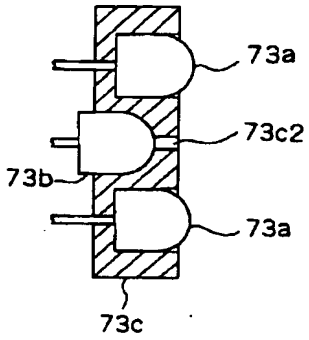
【図５】



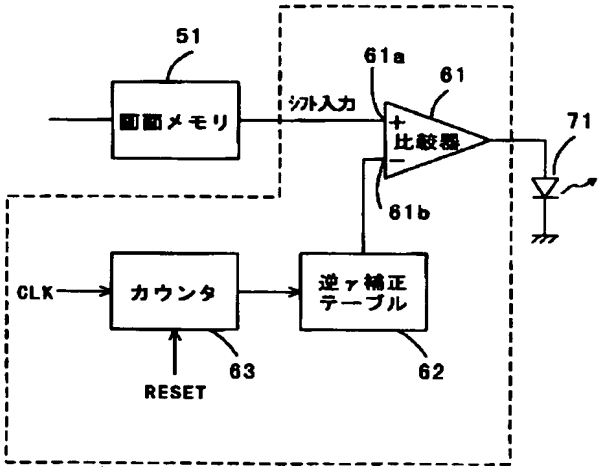
【図６】



【図１３】



【図７】



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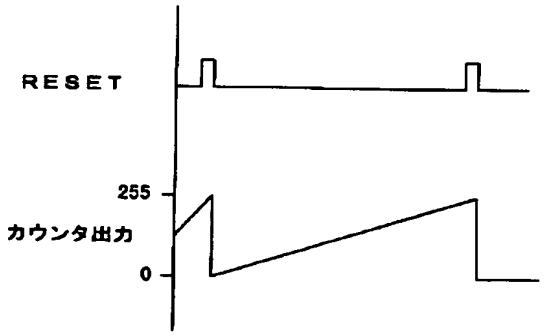
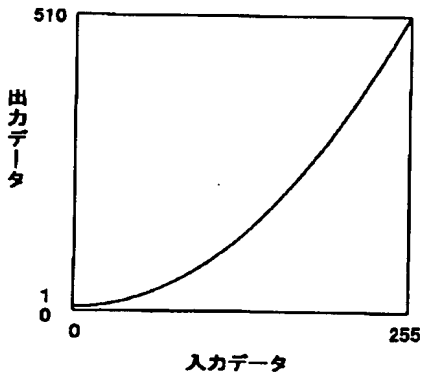
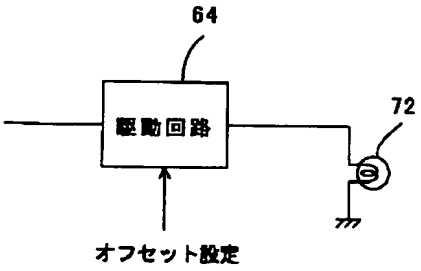


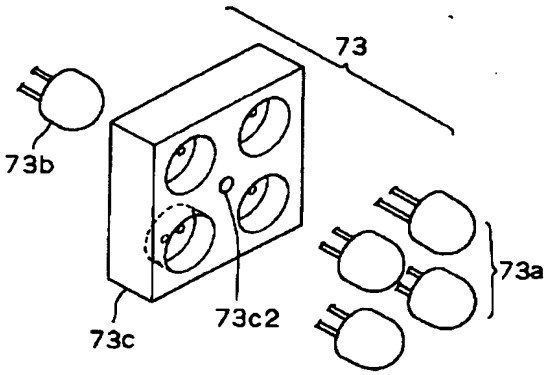
【図９】



【図１０】



【図１１】



【図１４】